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of the 9th International Conference on the Welfare Assessment of Animals at Farm Level (WAFL)

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Florence, Italy, 30 – 31 September, 2024

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Welcome to the 9th International Conference on the Welfare Assessment of Animals at Farm Level (WAFL) in Florence

Welcome to the 9th International Conference on the Welfare Assessment of Animals at Farm Level (WAFL) in beautiful Florence, Italy! This marks the first in-person WAFL since Wageningen in 2017, and follows the successful online WAFL conference in 2021. We are delighted to have the support of the Rome Office of the European Federation of Animal Science (EAAP) and our employer Teagasc, The Irish Agriculture and Food Authority, in organising this unique event. We also acknowledge collaboration with the Health and Welfare Commission of the EAAP. The WAFL conference will feature two full days of theatre and poster presentations on the science of welfare assessment in farm animals. This offers a focused experience for attendees, as well as the opportunity to engage in discussions about future challenges for Animal Welfare Science and Policy and on the future of the WAFL conference itself.

Local Organizer

EAAP
European Federation
of Animal Science

The European Federation of Animal Science (EAAP) is an international non-governmental organization focused on advancing animal production through research and knowledge dissemination. Founded in 1949 and based in Rome, the EAAP connects scientists, breeders, and administrators from 36 countries, mainly in Europe and the Mediterranean area. It emphasizes areas like genetics, nutrition, livestock management and more. The EAAP's flagship event is its Annual Meeting, which gathers global experts to discuss advancements in animal science. Additionally, it organizes smaller workshops and webinars throughout the year. The EAAP is also involved in numerous European projects aimed at enhancing animal welfare and sustainable farming practices.

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Scientific programme

Session 1. New frontiers in the assessment of animal welfare on-farm

Date: Friday 30 August 2024; 9:00 - 11:00
Chair: Kjosevski / Tuyttens

Theatre Session 1

Poster Session 1

Session 2. Humans in the loop – role of sociology in improving farm animal welfare

Date: Friday 30 August 2024; 11:10 - 13:10
Chair: Olmos Antillón / Giersberg

Theatre Session 2

Poster Session 2

Session 3. Welfare of farm animals at end of life (culling/euthanasia, transport and slaughter)

Date: Friday 30 August 2024; 14:00 - 15:30
Chair: Sørensen / Chou

Theatre Session 3

Poster Session 3

Session 4. New welfare indicators – with a focus on the positive!

Date: Friday 30 August 2024; 16:20 - 18:25
Chair: Spoolder / Blanco-Penedo

Theatre Session 4

Poster Session 4

Session 5. The future of animal welfare: policy and science

Date: Saturday 31 August 2024; 9:00 - 11:05
Chair: Hötzel / Widowski

Theatre Session 5

Poster Session 5

Session 6. It's all in the mind – cognition and the welfare of farm animals

Date: Saturday 31 August 2024; 11:15 - 13:15
Chair: Lee / Veissier / Ford

Theatre Session 6

Poster Session 6

Session 7. Suppress, substitute and soothe suffering – application of the 3S's to improve farm animal welfare

Date: Saturday 31 August 2024; 14:10 - 15:15
Chair: Winckler / Hartnett

Theatre Session 7

Poster Session 7

Session 8. Free communications in farm animal welfare

Date: Saturday 31 August 2024; 16:20 - 18:30
Chair: von Keyserlingk / Foy / Hendriks

Theatre Session 8

Poster Session 8

Session 1 Theatre 1

Plenary 1. Animal Welfare Assessment Protocols. From inputs to outputs and from the five freedoms to the five domains

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Traditionally, monitoring systems and legislation largely relied on examination of inputs (what/how much) of different resources, given to animals. However, animals may experience the same situation differently depending on many factors. Since welfare is a condition of the individual animal, an assessment should emphasize animal-based measures (also called outcomes). Although in animal welfare science this difference is clear, for the general public it is not, and systems are normally used that simply apply a guide of good practices to certify animal welfare. Furthermore, although it is clear that no leaving being can guarantee the welfare of another, it is common to read sentences like "with this label we ensure animal welfare". In this sense, a critical goal of animal welfare science should be to transfer to society the importance of animal-based protocols for the assessment of welfare at the farm level. To do this, we need to develop protocols for more species. As well as those developed for pigs, cattle and broilers/laying hens (Welfare Quality), and small ruminants, turkeys and horses (AWIN), in recent years animal-based protocols have been developed for rabbits, quails, ducks, sea-bass, sea-bream, dogs and even zoo animals. The development of these protocols has critical phases that include, among others, validity, repeatability, and feasibility. The second critical point to consider will be how to use new technologies and how to adapt these protocols to new trends in animal welfare. When Welfare Quality began in 2004, the only emotions considered in the scheme were absence of fear and pain, since this came from the five freedoms. During the project, absence of fear changed to positive emotional state and QBA was included in all protocols. This was a big step, but the five domains are another important advance that puts the emotional state of the animals in the spotlight. If you are concerned about the general emotional state of an animal, you should consider not only the absence of negative effects, but the presence of indicators of positive mood and welfare. This will give us new indicators and ways of assessing welfare and we will need to know how to integrate them in new or existing assessment protocols in a valid and robust way and, again, how to communicate them to society.

Session 1 Theatre 2

Ruffled minds? Time budgets and restlessness in bulls kept in different housing systems

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Scientific knowledge on the behaviour of bulls in different housing systems is scarce. This study aimed to increase the knowledge of bulls' daily time budgets in housing conditions ranging from barren to semi-natural. In addition, we assessed restlessness, which has recently been proposed as a potential indicator of chronic boredom in non-human animals and which we operationally define as the frequency of transitions between behaviours in a given time. To this end, we collected data from May to September 2022 from bulls housed on fully slatted floors (FS; n = 4 farms), in straw bedded systems (SB; n = 4) and on organic pasture (OP; n = 3). Each farm was visited twice. Direct observations covered the span between 6 AM and 10 PM. Focal animals were observed continuously for 8 min (in total n = 1857 observations; e.g. movements, exploration, social interactions, vocalisations) followed by scan sampling (10 min interval) for the basic activities such as walking/standing, lying, feeding. Data from FS and SB were analysed using generalised linear mixed-effect models, while those from OP were only described since OP farms varied strongly in their husbandry conditions. Walking/standing ($p = 0.010$; $\chi^2 1 = 6.30$) and lying ($p = 0.007$; $\chi^2 1 = 7.22$) was less frequently observed in FS than in SB, whereas it was the opposite for drinking ($p = 0.004$; $\chi^2 1 = 8.09$) and ruminating while lying ($p = 0.02$; $\chi^2 1 = 5.70$). Behaviour in FS and SB did not differ regarding eating feed ($p = 0.840$; $\chi^2 1 = 7.98$) and ruminating while walking/standing ($p = 1.00$; $\chi^2 1 = 0.00$). Behaviour in OP deviated more from behaviour in indoor housing systems than differed FS and SB from each other. FS and SB did not differ in the number of transitions ($p = 0.62$; $\chi^2 1 = 0.24$). Numerically, bulls in OP showed by far the lowest number of transitions. The high level of restlessness in FS and SB compared to OP indicates a comparable level of barrenness, monotony or intensity of husbandry conditions in both indoor systems. Further research on restlessness and its potential association with the animals' welfare state is suggested.

Session 1 Theatre 3

On-farm animal welfare assessments in a European project on global quality: results, limitations and lessons learnt

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Animal welfare is increasingly recognised as an integral component of livestock system sustainability, thereby necessitating to be incorporated into on-farm sustainability assessments but this may involve practical challenges. In the EU INTAQT project, sustainability, including environmental impacts, intrinsic quality of products and animal welfare, was assessed on farm across diverse farming systems for dairy cows (71 farms), fattening beef (51 farms) and broilers (57 farms) from 10 countries. Welfare was assessed at farm level according to AssureWel protocol for cattle and EBENE® protocol for broilers and the observers were trained online. The principal component analysis of animal-based measures (ABMs) from the cattle welfare assessments highlighted variability across countries and therefore systems, but the effect could be linked to the observers, since observer, country and sometimes systems were confounded. ANOVA and variance tests for each ABM (ABM ~ Observer) showed that for ABMs requiring observation (e.g., Lameness, Hairless patches) the means and the variances depended on the observers ($p < 0.05$). In broilers, we did not observe variations between observers. The difference between cattle and broilers could be explained by ABMs easier to observe for broilers than for cattle where ABMs seem to be harder to standardise. Though statistical analysis can be performed per country, this observer bias in cattle assessments highlights practical difficulties and limitations in integrating animal welfare into on-farm sustainability evaluations, particularly in a multi-country European project. Common guidelines on how and what to include for animal welfare in sustainability assessments, extensive training of observers and a good repeatability between them are pre-requisites to ensure data quality in multi-partner projects. More generally, the risk of over simplifying each dimension by increasing the complexity of livestock sustainability concept and therefore its on-farm assessment needs to be considered for future global sustainability evaluations.

Session 1 Theatre 4

Identifying optimal combinations of welfare indicators

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Meaningful metrics are necessary to monitor and enhance farm animal welfare. We created a database for Norwegian animal production systems based on European Food Safety Authority's reports on animal welfare. The database currently contains 389 welfare indicators for dairy cows and calves, pigs, beef cattle, broilers, laying hens, and sheep. These are linked to both unique and shared welfare consequences / hazards, providing an opportunity to identify optimal combinations. We aimed to find the simplest combination of indicators associated with maximal welfare consequences and hazards. As the number of unique combinations increases exponentially as more indicators are combined, we validated our approach using a subset of six indicators for broiler chickens and six for laying hens. We ranked each indicator on the number of linked unique welfare consequences. The top-6 iceberg indicators for broiler chickens were injurious pecking, plumage damage, lethargy, footpad dermatitis, feather & body dirtiness, and walking impairment, and for laying hens were plumage damage, injurious pecking, bruises, beak shape & length, pecking wounds to back, vent & tail, and flock records (death due to pecking wounds). We counted the number of welfare consequences and hazards linked with each possible unique combination of indicators ($(2_6) – 1) = 63$). Utilising all 6 indicators explained a maximum of 18 welfare hazards and 9 consequences for broiler chickens, and 14 welfare hazards and 6 consequences for laying hens. We could more simply explain the same welfare hazards and consequences by measuring only lethargy, feather & body dirtiness, walking impairment and either injurious pecking or plumage damage for broiler chickens, and by measuring only plumage damage, injurious pecking and flock records (death due to pecking wounds) for laying hens. This approach demonstrates utility in operationalising the selection of indicators. Our future work will integrate factors such as indicator ease of use, cost implications, welfare hazard impacts, and mitigation ease for all species and indicators.

Dairy cow welfare – Do we need seasonal evaluations?

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The Welfare Quality® (WQ) Protocol describes an established, refined way to assess dairy cow welfare. Assessment is to be performed during the indoor period, thus mainly reflecting wintertime welfare. However, some farms may be better equipped to deal with the welfare challenges typical of one season than of another: good 'winter farms' may not necessarily be good 'summer farms'. To evaluate this, we assessed the same 7 farms in winter, spring, and summer, and 4 of these in autumn. Seasonal pasture access was given on 5 farms. We present the results for 6 WQ criteria. We analysed seasonal effects using linear mixed models (fixed: season, random: farm). Resting comfort and social behaviour differed between seasons ($P<0.01$ and $P=0.05$, respectively). Mean resting comfort scores were 41, 57, 55 and 45 ± 5 SEM for winter, spring, summer and autumn, respectively. For social behaviour these were 68, 83, 86 and 76 ± 6 SEM. No seasonal influences on criteria related to hunger, injuries, human-animal-relationship or positive emotional state were found ($P>0.10$). Although numbers were too low for formal analysis of farm characteristics, the seasonal uplift in resting comfort was not exclusive to grazing farms, whilst that for social behaviour was but did not occur on all of these. We also evaluated if farms' ranking amongst their peers was consistent over seasons, using Spearman correlations, excluding autumn data. Spring and winter ranks for positive emotional state were positively correlated ($P=0.003$, rho=0.96), i.e., farms scoring well relative to their peers in winter also did so in spring. However, no significant correlations were found between the other seasons, or between any seasons for the other criteria ($P>0.10$, rho=-0.8 – 0.6). Role reversals (where a farm in the top 2 during one season was in the bottom 2 in another) occurred within all 6 criteria. This occurred because the farm's own score changed, or because the farms' peers seemingly leveraged a seasonal advantage that the one farm did not profit from. The observed seasonal differences and the inconsistency in farm ranking suggest that reliable assessment requires multiple visits in different seasons.

Validity and reliability of the animal-based measures of welfare protocols in finisher pigs

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Welfare protocols have been developed to enable a rapid and immediate overview of animal welfare on farm, e.g. for animal welfare inspection. Recently, a refined protocol was designed in the mEATquality project (European Union grant no. 101000344), to map animal welfare across countries and evaluate the effects of different extensification factors. While the resource-based recordings of this protocol are likely consistent over time, it remains unclear to what extent the animal-based measures of the protocol (e.g. clinical and behavioral observations), observed at a specific time point, are representative of the whole production period. In addition, knowledge on whether these measures can report actual differences in animal welfare is scarce. This study aimed to evaluate whether improvements in pigs' access to resources can be quantified by animal-based measures (i.e., whether the measures are valid) and to determine whether a single measurement point is representative of the entire production period or only illustrates the state of the animals at a given time (i.e., whether the measures are reliable). A total of 415 pigs in 30 pens were housed in an experimental facility from 30 kg up to slaughter, with each pen attributed to either 1 of 4 welfare improving treatments (increased space: 1.4 or 2.1m2 per pig, provision of roughage, extra provision of enrichments) or to a control. Throughout the experimental period, animal-based measures of the protocol were observed weekly. All indicators, both clinical and behavioral, showed poor reliability on pen level across the 10 weeks. Of clinical indicators, only bursae and pig dirtiness differed between treatments, with higher odds of bursae and lower odds of being dirty in pens with more space per pig. Of behavioral indicators, a numeric trend was found for more aggression in pens with enrichment and roughage, and more mounting in pens with less space per pig. These results call for attention over the use and interpretation of the animal-based measures obtained from a singular welfare assessment.

The impact of farm biosecurity implementation on the level of animal welfare

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The significance of disease prevention in farm animals through improved farm biosecurity (FB) and higher levels of animal welfare (AW) are widely acknowledged. The objective of this study was to identify the impact of FB on AW through a review of the scientific literature. This review was conducted as part of the activities within the COST Action BETTER. Following a systematic literature search across four databases (Web of Science, Scopus, CABI and Medline), a total of 3,779 abstracts were retrieved. Among these, 869 abstracts were identified by two reviewers as relevant studies for assessing biosecurity and/or its impact. Out of these, only 16 abstracts were categorized as studies that investigated farm AW. All identified studies were observational, collecting on-farm data. The majority of the studies focused on cattle (n=11), with fewer studies involving pigs, poultry, and sheep. Two studies examined small-scale farms. In addition to AW, the studies also examined the impact on animal health (n=6), antimicrobial resistance (n=3), economic impact (n=2), and pathogen presence (n=2). Half of the studies (n=8) conducted combined on-farm assessments of AW and FB without further analysis of potential associations between them. Two other studies included independent assessments of antimicrobial resistance. The five studies (31%) identified as relevant for the impact of FB on AW present varied and inconsistent results. These range from no association, to absence of conflict, data interconnections, and positive associations between AW and FB. These findings indicate a lack of comprehensive understanding regarding the integration of AW and FB, particularly the combined implementation of FB and AW.

Welfare of dairy cows on farms practicing cow-calf contact rearing or early separation

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Cow-calf-contact systems (CCC) have the potential to improve the welfare of cows and their calves in dairy production compared to common early separation systems (ES). Within the framework of the transdisciplinary project 'COwLEARNING – for sustainable beef and dairy supply' we aim to compare the sustainability of the two above mentioned farming systems, including animal welfare as a parameter of the social dimension. We hypothesized that the welfare of cows would be higher in CCC systems compared to ES systems. During the non-pasture season from November 2022 until April 2024, we visited 25 ES dairy farms (herd size mean±SD: min-max, 36 ± 14.91: 13-75) and 24 CCC farms (30±17.62: 11-79 cows). Two trained observers assessed the welfare of the animals using the Welfare Quality® protocol for dairy cows. For statistical analysis we employed the ANOVA or Mann-Whitney-U Test (MWU) respectively, depending on the distribution of the data. The preliminary analysis comprises measures of health and QBA. Analysis of health parameters revealed differences in integument alterations (p=0.003) and lameness (p=0.025) between the two systems. While the prevalence of integument alterations (hairless patches and/or lesions) was higher in CCC systems (mean±SD: min-max 61,6 ± 28,42 : 0 – 100) compared to ES systems (38.5 ± 19.95: 2.78 – 85.45), there was a higher prevalence of lameness (moderately and severely lame) in ES systems (median, min-max: 10.34, 0 -64.4) compared to the CCC systems (4.46, 0 – 26.6). No difference was found in any other health parameter. The QBA score of cows on farms did not differ between the systems (CCC: median, min-max: 69, 0-85; ES: 52, 0-88) emplying the MWU test (p=0.146). Also, in the remaining health parameters no differences between systems were found. Further analysis regarding the measures of the Welfare Quality® protocol and including potential influencing factors will be finalized before the workshop to allow a comprehensive comparison. The project COwLEARNING is funded by the Austrian Science Fund (FWF): CM 400B

Session 1 Poster 9

Assessment of cow quality of life at the system level on pastoral dairy farms in New Zealand

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Welfare assessment protocols typically provide information regarding individual animal welfare to assure present day welfare standards are being met. However, welfare assessments can support enhanced welfare rather than just meeting minimum standards. This could be achieved by considering the potential impact on welfare of systems under which animals are kept. We developed a tool to identify opportunities and risks for cow quality of life at the system level across pastoral dairy farms and piloted the tool in New Zealand. The Farm System Welfare Assessment tool was developed using a framework adapted from the Five Domain Model. Eighteen system attributes were identified across four domains (nutrition, physical environment, health, and behavioural interactions) and three further system attributes related to 'people'. Definitions for low, moderate, or high-risk were developed for each system attribute, informed by scientific consensus to capture the degree of opportunity and risk of a cow to have negative or positive experiences. In total, 222 farms were visited, and each attribute was assessed per season. Seasonal differences were expected due to New Zealand's predominantly spring calving system. Results were summarised to provide an average score for each attribute. Most attributes (85% across farms) were identified as low risk; although, 19% of attributes were classified as either moderate or high risk, i.e. negative experiences may exist or opportunities for positive experience are restricted, at least at certain times of the year. High risk attributes with the potential to restrict opportunities for positive experiences included inadequate staffing, exploration and grooming during winter, and expression of maternal behaviour. High risk attributes where negative experience may occur included thermal stress. Low risk attributes included opportunities to forage, have daily routine and social contact. The tool provided us an objective science-based method to identify aspects of New Zealand farm systems that provide opportunities for neutral or positive experiences, or restrict these opportunities, and where negative experiences may occur.

Session 1 Poster 10

Could the individual water intake serve as a predictive factor for the health status of beef cattle?

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Unlike dairy cows, individual daily water intake (DWI) in intensively finished beef cattle has been unexplored, mainly because of the limited use of advanced technologies that could regularly gather specific parameters. This study explored beef cattle's DWI as a potential early sign of diseases, right after their arrival at the fattening unit. It was conducted on a beef farm in Veneto region, Italy, using 92 Limousine cattle imported from France in 6 batches from May 2021 to December 2022. Upon arrival, cattle were housed in a single pen for a 1-month adaptation phase, where an individual drinking station prototype was installed. Any animal was identified at the entrance by RFID ear tags, and DWI was automatically measured by a flowmeter inside the drinker. The farmer checked the individual animals' health daily, registering all treatments. Maximum environmental temperature and relative humidity were gathered daily and combined in a single index, the THI, which was classified into 4 thermal discomfort levels: No risk THI ≤72; Low-risk 72-78; Alert 79-83; and Danger ≥84. The DWI was classified based on tertiles distribution: low ≤20.8 L/day; mid 20.8-28 L/day; high ≥28 L/day. The prevalence of treated animals was analyzed using the GLIMMIX procedure of SAS, including the batch's arrival season, DWI level, and THI class as potential risk factors, with animal as random. All treatments made by the farmer were for the bovine respiratory disease (BRD) and provided within the first 15 days of adaptation. A low DWI in beef cattle was a predisposing factor for BRD compared to a higher DWI ($P<0.001$), having a relative risk (RR) of being treated more than 4 times higher. The prevalence of treated animals was lower for those entering the farm in May and July than in September, November, or January. Animals entering the farm in September showed the highest RR of being treated for BRD. Animals showed a higher prevalence of treatments for BRD on days with Low-risk, Alert, and Danger THI classes than on days with No risk. The prototype proposed offers valuable insights into the health status of intensively finished beef cattle.

Session 1 Poster 11

Integrating AI and Welfare Frameworks for Initial Farm Animal Welfare Assessment

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The integration of animal welfare science and artificial intelligence (AI) represents a unique opportunity to advance the understanding and assessment of farm animal welfare. This study illustrates the outcomes of a research project that integrates AI into a welfare assessment model to facilitate the quantification of farm animal welfare across species. We introduce a user-friendly tool that leverages AI capabilities to provide rapid and insightful quantification of animal welfare at the farm level in a report-like format, ready for expert review. The methodology is anchored in the Five Freedoms framework, and welfare impacts are quantified as time spent in affective states of different intensities as proposed by the Welfare Footprint Framework. The analytical tool is implemented as follows: (1) an interactive questionnaire collects information on the farm's external and internal factors affecting the animal population, (2) the Welfare Needs of the species are mapped and compared against these factors using the Five Freedoms framework as a guide, identifying both positive and negative affective states arising from the consistencies and inconsistencies emerging from the comparison; (3) the Welfare Footprint framework is used to quantify the cumulative time in negative and positive affective states of different intensities (Cumulative Pain and Cumulative Pleasure, respectively) experienced by the animals as a result of these consistencies and inconsistencies and (4) the outcomes of the analysis are discussed in terms of the welfare impacts experienced by the population along with suggestions for improvement. This method offers a rapid but thorough assessment of farm animal welfare accessible to both researchers and producers. Examples from real cases volunteered by conference participants can be analysed. While expert validation is always necessary for AI-generated outputs, this tool offers a starting point of immediate value for farm animal welfare assessment initiatives, particularly in low-resource settings. Additionally, by quantifying welfare impacts using universally understandable metrics (time spent in affective states of varying intensities), the approach also has significant potential to impact policies and practices positively.

Session 1 Poster 12

Benchmarking welfare for grazing beef cattle in Australia

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Animal welfare is increasingly important in livestock production. Systems that can collect welfare related data to benchmark performance could provide evidence for welfare compliance, assurance and/or improved management. This project aimed to identify and validate animal welfare indicators for extensive beef cattle to develop a system to benchmark farm level welfare performance against comparable farms under Australian conditions. A literature review was conducted to identify a list of welfare measures that were refined through stakeholder consultation. A secure online data entry platform was developed for data collection by producers on 21 commercial beef farms over an 18-month period. The validity and repeatability of several on-animal measures were tested. The data platform was further refined based on feedback from producers. Components of the platform included property and livestock profiles, animal records (feed/water, health and animal management, disaster and biosecurity planning), yarding events (planning, methods, hazards, records), stock people attitudes and training. From the data entry, an instantly generated feedback report was provided to show level of compliance with Australian Animal Welfare Standards. In addition, benchmarking reports for individual producers were generated to describe the performance of individual farms and compare them against similar farms. Data from all producers were also pooled to represent the reporting of welfare performance at an industry level. Overall, the outcomes from the project include a suite of feasible, valid, and reliable welfare indicators and a data collection and reporting platform that was developed in consultation with stakeholders. The benchmarking measures and data platform developed in the project could provide the basis for welfare assurance programs tailored to specific industry needs. Potential benefits to the beef industry of implementing the system include the ability to demonstrate compliance with standards, monitor and improve welfare performance, and to demonstrate continual improvement in animal welfare into the future.

Session 1 Poster 13

Evaluation of an animal welfare assessment protocol for male laying hybrids and dual-purpose cockerels

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The animal-based MTool welfare assessment scheme for pullets and laying hens was modified for male laying hybrids and dual-purpose cockerels and its reliability and feasibility were tested. Some indicator definitions were adapted for the males (e.g. head injuries, feather damage, plumage soiling) and additional indicators were included (e.g. breast skin alterations, hock burns, lameness). Most indicators are to be assessed on a sample of 50 cockerels on-farm, for lameness and diarrhoea using the transect method, or at the slaughterhouse. Two trained persons conducted six inter-rater comparisons (48-109 birds per indicator). The time required to apply the protocol (feasibility) was measured in seventeen organic flocks (8 x male laying hybrids, 9 x dual-purpose cockerels) shortly before slaughter. The average prevalence-adjusted bias-adjusted kappa (PABAK) indicated good (>0.60) to very good (>0.80) reliability for head injuries (0.80), beak alterations (0.72), eye and nose alterations (1.00), respiratory infections (1.00), feather damage (0.81), plumage loss (0.90), skin injuries (0.69), plumage soiling (0.83), breast skin alterations (0.96), keel bone damage (0.91), toe injuries (0.64), hock burns (0.93), foot pad alterations (0.86), lameness (1.00) and diarrhoea (0.92). The average time taken to assess the welfare indicators for a sample of 50 animals was approximately 148 minutes (96 to 205 minutes), of which about 20 minutes were required to assess lameness and diarrhoea using the transect method. Therefore, the newly developed animal welfare protocol for cockerels appears to be suitable for internal or external animal welfare monitoring.

Session 1 Poster 14

Identifying livestock at risk of poor welfare, using animal and farm related risk factors, in Australia

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An animal welfare risk assessment tool (AWRAT) was developed using risk factors about the farm, the animals and their management. The risk factors were selected if they were: rated by industry experts as more likely to be observed on farms with poor than good livestock welfare, easily observed and logically connected to poor welfare. Examples include various factors about the suitability of nutrition, fencing, stock handling facilities, stocking rate, breeding times and the timeliness of treatment. The intention was for the AWRAT to assist in identifying livestock at risk of poor welfare (in breach of the relevant legislation) and situations where reoffending was likely. In a recent study, animal welfare investigators rated the relevance of each risk factor to the situation on farm during welfare and non-welfare related visits. An algorithm was developed to calculate an AWRAT risk rating (AWRAT-RR) based on the assessment. The algorithm was weighted considering the likely impact of the factors on welfare and the challenges to reducing the risk including time and cost. Following farm visits participants first provided a subjective welfare rating (WR) and then completed the AWRAT assessment. The WR was a value from 0-100, selected by the participant as a measure of the overall welfare state of the livestock at that point in time. Using linear regression, the AWRAT-RR was compared to the WR. This preliminary testing showed that the AWRAT was good at identifying livestock with poor welfare, with adjusted R squared values varying from 0.79-0.8. Further testing is required to determine if the AWRAT can reliably identify livestock at risk of poor welfare and situations where reoffending is likely to occur. If reliable, the AWRAT could contribute to identifying livestock at risk earlier, facilitating early intervention and ongoing support, improving welfare outcomes for livestock.

Session 1 Poster 15

Broiler chicken use of platform enrichments varies with age and time of day

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The provision of environmental enrichments allows animals the opportunity to make choices that promote their own quality of life. Providing broilers with elevated platforms has been shown to improve their welfare; however, research is limited on the use of platform enrichments throughout the day and at different ages. The objective of this study was to evaluate the use of platforms by broiler chickens during a 24-hour period at different ages. In a randomized design, broiler chickens were raised in eight pens, with six pens containing white plastic slatted platforms on two sides of the pen (P) and two pens with no platforms (C). Video was recorded for a 24-hour period on a weekly basis and, using instantaneous scan sampling, the number of birds observed in the litter area and the platforms was recorded at 15-minute intervals for all the birds each pen (96 scans/pen). Scan data were condensed into four-hour periods and were analyzed as percentages with linear mixed models using Restricted Maximum Likelihood (REML) in JMP Pro (v17) with age and time of day as fixed effects. Preliminary results are reported for days 16 and 23 of age. A greater ($P<0.0001$) percentage of birds were observed on the sides of the P pens (platform location, 61%) than in C pens (31%). Within P pens, a greater percentage of birds were observed on the platforms during the dark hours of the photoperiod, with the greatest ($P<0.0001$) percentage observed during hours 0000-0300 (86%). Also, within P pens, a greater percentage ($P<0.0001$) of birds were observed on the platforms on day 23 (64%) compared to day 16 (59%). The results from this study indicate that broiler chickens used the platforms more during the dark hours of the photoperiod and use varied with age.

Session 1 Poster 16

Assessing Animal Welfare in Chilean Dairy Production: Strengths, Weaknesses, and Opportunities for Improvement

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In recent decades, animal welfare has been crucial for the food chain and dairy production, influencing product quality. Producers have begun implementing animal welfare measures and seeking certifications, such as Welfair®. Although recognized in Europe since 2018, the implementation of Welfair® in Latin America began four years ago. In October 2023, the first Chilean dairy company obtained this certification, marking a regional milestone. The adoption of these seals aims to differentiate production systems, be recognized by consumers, and add value to products, distinguishing them from competitors. The study analyzed the strengths and weaknesses of 21 dairy farms in southern Chile to obtain the Welfair® certification. The adapted Welfare Quality® Protocol and a legislation checklist based on European regulations were utilized. The evaluated dairy farms located between the regions of La Araucanía and Los Lagos varied in size and breed, with 57% operating on grazing systems and 43% confining animals during winter for up to two months. The regional distribution was 19% in La Araucanía, 48% in Los Lagos, and 33% in Los Ríos. The data from 21 dairy farms were analyzed using Infostat software employing a multivariate principal component analysis (PCA). The aim was to identify patterns and variables representing strengths and weaknesses. According to the analysis of PCA1, the variables that enabled obtaining the animal welfare certificate were related to behavior expression, absence of hunger, and ease of movement, explaining 45% of the variability. These strengths are primarily associated with pasture-based production systems, presenting an opportunity for Chilean dairy farms. However, the human-animal relationship was a notable weakness, with 95% of the farms rated below the standard, posing a threat to pasture based production systems due to the lack of an adequate indicator for evaluating this criterion in pasture. The analysis of PCA2 indicated that the absence of thirst and diseases were other identified weaknesses, underscoring the importance of water availability and cleanliness of drinkers to obtain the Welfair® certification for animal welfare.

Session 1 Poster 17

Welfare of calves on farms with cow-calf contact compared to early separation using the Welfare Quality® protocol

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As part of the transdisciplinary project "COwLEARNING for sustainable beef and dairy supply" innovative dairy farming systems will be compared with mainstream systems in terms of sustainability including animal welfare as a fourth dimension besides the ecological, economical, and social one. We aimed to investigate potential differences between farms with cow-calf contact (CCC) as an innovative system and farms practicing early separation (ES) of cow and calf with respect to calf welfare using the Welfare Quality® protocol. We hypothesized that welfare is higher in calves on CCC farms than in those on farms with ES. Welfare of cows and heifers was assessed as well but not in focus of this abstract. Calf welfare was assessed using the Welfare Quality® protocol for dairy calves on 24 CCC and 25 ES farms in Austria by two trained observers. The number of calves per farm ranged from 3–23 (mean±SD 9.6±5.09) on CCC and from 3-24 (11.8±5.83) on ES farms. Preliminary analysis revealed that scores for Qualitative Behaviour Assessment (QBA) of calves were higher at CCC farms compared to ES (t-test: $p<0,001$), ranging from 52-100 (mean±SD 73.2±13.25) on CCC and from 28-82 (53.9±12.70) on ES farms. Calves had lesions and ocular discharge only on one CCC farm but on 8 or 6 ES farms (Chi² test: $p=0.023$ or 0.098) with prevalence of lesions ranging from 0-7% on CCC and 0-66% on ES and of ocular discharge on CCC farms 0-10%, on ES 0-94%. There was no difference in the other 14 clinical parameters. Our hypotheses were confirmed partly. The higher QBA scores indicate a higher emotional well-being of CCC calves. In terms of health, the results point to only limited benefit. The project is funded by the Austrian Science Fund (CM 400-B).

Session 1 Poster 18

Validation of qualitative behavior assessment for dairy cows at pasture

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Qualitative Behavior assessment (QBA), based on a fixed list of adjectives, has been validated as a measure of emotional state for indoor dairy cows. A validated tool to assess the emotional state of cows at pasture is lacking. We investigated the validity of QBA at pasture: relevance, observer reliability and selectivity. First, 20 videos of dairy cows at pasture were watched 4 times by 5 observers. The observers performed a QBA using the terms proposed in Welfare Quality®. A principal component analysis performed on these observations (n=400) yielded a 1st axis representing emotional valence (PC1, from irritable to content) and a 2nd axis representing arousal (PC2, from calm to active). Second, to assess observer's reliability, Kendall's concordance coefficients (KW) were calculated for observations coordinates on PC1 and PC2. Intra-observer reliability was good (KW> 0.75), whereas inter-observer reliability was moderate to good ($0.5<KW<0.9$) for both axes. Third, live QBA were performed by 2 observers on a cow's herd at pasture during 3 contexts supposed to have different emotional valences and arousals: in the morning after milking (AM), in the afternoon before milking (PM), and, during handling to gather cows on pasture plot (HA). We investigated the effect of context on both PC1 and PC2 with linear mixed effects models. AM and PM contexts had higher values on PC1 than HA. PM context had lower values on PC2 than AM and HA. QBA at pasture was thus able to discriminate contexts differing in emotional valence and arousal. Fourthly, one observer assessed cows' reactivity at HA through direct behavioral observations, followed by QBA. Pearson correlation coefficients were calculated between the number of observed behaviors and observations coordinates on PC1 and PC2. HA duration and the number of trotting behaviors were negatively related to PC1 ($r=-0.70$ and -0.71) and the number of galloping and turning around observed during HA were positively related to PC2 ($r=0.77$ and 0.60). QBA performed at pasture has the potential to capture cow's arousal and emotional state. In conclusion, QBA appears to be a valid measure of the emotional and arousal state of dairy cows at pasture, but inter-observer reliability could be improved.

Session 1 Poster 19

On-farm welfare assessment of extensively kept ewes in Austria

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Access to pasture for most of the year provides benefits for sheep regarding normal grazing and social behaviour, available space, good air quality and is perceived as desirable by consumers. On the other hand, animals can potentially suffer from adverse weather conditions, parasitic infections and lack of access to shade or water. Therefore, the aim of this study was to assess the welfare of ewes in semi-extensive grazing system in Austria to provide an overview for farmers, advisors and decision makers for the first time. Twenty-three sheep farms (14 organic, 9 conventional) were involved, which were visited twice by always the same trained observer. The first assessment took place during the grazing season and included (1) a farmer questionnaire (e.g. lambing and grazing management, preventative measures, feeding strategy), (2) selected welfare indicators of ewes on pasture on group level and (3) details of the pasture paddocks, including access to water, shade or shelter. The second visit was conducted after the grazing season and focused on the assessment of individual animals, including 27 animal-based indicators, based on AWIN protocols. Data are presented descriptively. Farm characteristics varied widely regarding breeds, farm size and pasture management. The median herd size (min – max) was 80 ewes (30-380) and the median outdoor period was eight month (6-10). The welfare of the ewes, which includes parameters like fleece condition, claw or body condition, was considered good in both assessments. Disease incidence was low, foot rot, pseudotuberculosis and clostridial disease were mentioned as problem on two farms each. However, tails were docked on almost all animals, with a median prevalence of 89% (0-100), even when routine tail docking is not allowed. For most flocks access to water, shelter or shade was available, however, restricted excess to shade, shelter or water was a problem on two farms each. The results of this study provide an important first overview of the welfare of ewes in extensive grazing systems in Austria, which serves as a basis for farmers regarding short term welfare improvements (e.g. provision of water), as well focus areas for advisory bodies (e.g. routine tail docking) for further strategical improvements across all sheep farms in Austria.

Session 1 Poster 20

The diversity in dairy cattle reticuloruminal temperature: Identifying variability in drinking behaviour

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Water plays an essential role in all major physiological processes in the body but despite this, we have limited knowledge as to cattle drinking behaviour. Our experiment aimed to confirm the variability in drinking behaviour for pasture based dairy cattle. We determined the temporal variability in drinking events for 1,429 mixed breed cattle across three dairy farms over four years, using reticulorumen temperature profiles (smaXtec Animal Care GmbH). Animal ethics approval was not required as the data were already being recorded by the farms for their own use. Using a water intake model (F1 score = 0.99), we showed cattle to have a greater number of daily drinking events during summer (mean 4.1, standard error (SE) 0.003) than in winter (mean 3.3, SE 0.003). Increasing drinking events per day was negatively associated with reticulorumen temperature (Spearman's correlation rs = -0.4), suggesting that smaller volumes of water were consumed with a greater frequency of drinking events. Drinking event duration remained consistent across seasons (summer mean 96 mins, SE 0.1 mins; winter mean 99 mins, SE 0.1 mins) though variability in cumulative temperature loss during a drinking event was evident (summer mean 2.7°C, SE 0.1°C; winter mean 3.7°, SE 0.2°C). These results contribute to an improved understanding of drinking behaviour through a remote method of health monitoring. Further work will explore the direct interaction of climate on individual animal drinking events and core body temperature diversity.

Relationship between biosecurity practices and ear necrosis on commercial Irish pig farms

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Ear necrosis (EN) is a complex pathology resulting from the interaction between ear biting and internal disruptions, with hygiene and management as major risk factors. EN involves bleeding and scabbing of the ear tip and may develop such that the ear degrades (necrotises). Almost all EN lesions heal before slaughter, but it represents a serious welfare problem for weaner pigs. Ear loss (EL) on carcasses at slaughter is obvious and could be a proxy for EN on farm. This study investigated the relationship between EN and EL prevalence on farms and EL at slaughter, and associations with biosecurity practices. Biosecurity practices of 18 farms were surveyed using the Biocheck.ugent® questionnaire (Mar '22-Jan '24). The number of pigs with EN (mild, moderate, and severe) and EL in 8 pens across weaner and finisher stages were recorded (July '23–Mar '24). EL (0-3 according to severity) at slaughter was scored post-mortem for one batch of pigs/farm within 1mth of the farm inspection. Biocheck.ugent® contains 118 questions resulting in scores for 12 biosecurity categories, from which overall, internal and external biosecurity scores are calculated. Higher scores indicate better biosecurity. EN and EL% was calculated per farm. EL scores at slaughter were collapsed (yes or no) and % of EL/batch was calculated. Spearman rank correlations (SASv9.4) determined associations between biosecurity scores, EN and EL on-farm, and EL at slaughter. EL at slaughter was associated with total EN ($r=0.53$, $P=0.02$). Moderate EN tended to be negatively correlated with both the overall biosecurity score ($r=-0.45$, $P=0.06$) and the internal biosecurity score ($r=-0.43$, $P=0.07$). Moderate EN was negatively correlated with both the 'finishing unit management' ($r=-0.53$, $P<0.05$) and 'measures between compartments and use of equipment' ($r=-0.67$, $P<0.05$) scores. 'Disease management' score was positively correlated with EL on farm ($r=0.51$, $P<0.05$). The 'Cleaning and disinfection' score tended to be positively correlated with severe EN ($r=0.41$, $P=0.09$) EL at slaughter ($r=0.40$, $P=0.1$). One component of the external score, 'feed water and equipment supply', tended to be negatively correlated with EL on farm ($r=-0.43$, $P=0.07$). Our results indicate that EL scoring at slaughter reflects the prevalence of EN on-farm and that aspects of biosecurity management on-farm influence EN disease in pigs.

Plenary 2. An 'inclusivity' turn for animals: what social science and humanities research can do to improve farm animal welfare.

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In the contemporary moment, researchers are asked to show consideration for Diversity and Inclusivity not only in terms of who, what, and where we study, but also in how to critically consider the interpretive lens we bring to making knowledges we share and communicate as research findings. What opportunities may lie in the future if farm animal welfare science more fully considers 'inclusivity' in the methodologies we use to try and improve farm animal welfare? Arguably, this is especially relevant given the range of global challenges (climate crisis, biodiversity loss, antimicrobial resistance) that connect intensive farmed animal lives with human lives through the planetary demands of intensive livestock production. How can we include farmed animals as active agents in knowledge-making to support the need for different futures? I will draw on over 20 years' of experience working in the field of human-animal relations (Davies et al 2023), including farm animal welfare (Buller and Roe 2018), to discuss what the humanities and social sciences can contribute to its improvement. This field has supported the development of methodologies (Bastian et al 2017); where animals in their diversity are active research participants. Within these multispecies encounters animals may participate alive (or dead, including as meat), or in creative form. What curiosity is expressed or experiences are shared when sewing a felt laboratory mouse or chicken (Roe et al 2023)? How to ethically respond in the contact-spaces within multispecies caring and harming relations (Roe and Greenhough 2023)? For animal welfare science, these methods help to hold and analyse the complexities and contingencies that explain the political-economics, ethics and socio-technical challenges and opportunities that surround making improvements to animal lives. Yet, I argue they also show the way to becoming inclusive to different ways of doing things; different priorities (welfare, sustainability) can attend to a broader range of interests than those commonly explained through the supplies and demands of food chain dynamics; markets are cultural, and thus inclusivity may offer radical potential for things to turn otherwise.

Session 2 Theatre 2

Who cares for happy cows? - Exploring views of dairy stakeholders around an automated animal-based welfare assessment tool

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Precision livestock farming (PLF) provides new opportunities to continuously assess production-related traits and monitor animal welfare. This study examines the complexities of adopting an automated welfare assessment tool in Swedish dairy farming. Through an iterative qualitative design, we engaged dairy farmers (n=10), advisors (n=5), industry experts (n=2), and PLF product managers (n=3) to co-develop insights. Online focus groups (n=8) served as a platform to explore participants' cultural nuances, discourses, and practical challenges surrounding animal welfare indicators linked to feeding, comfort, health and behaviour. A reflexive thematic analysis exposes strains between advisors' perceptions and farmers' meanings and practices. Despite assumptions of 'farm blindness' by other stakeholders, farmers demonstrate awareness and interest in comfort-related welfare indicators, shaping their meaning of a 'happy cow'. However, farmers express an inability to act swiftly to improve comfort due to factors like limited capacity, support and infrastructural capacities. Farmers' actions were often interpreted as indifferent by other stakeholders, overlooking farmers' nuanced prioritisation strategies. This suggests that there is a lack of long-term advisory support that aligns with farmers' capabilities and constraints. Conversations also underscore farmers' doubts about the commitment and backing of supervising bodies as they contest the value of sharing animal welfare data among interested stakeholders. This highlights another strain between stakeholders arising from a lack of shared understanding and motivations for welfare assessment. Our study underlines the importance of bridging the gap between scientific knowledge and on-farm practices, particularly in defining actionable guidelines for addressing welfare concerns. We conclude that stakeholders could readily facilitate meaningful gains in animal welfare by recognizing farmers' agency capabilities and providing tailored, contextually relevant support that signals the industry's support to farmers, not only a self-need to retain a delicate license to operate.

Session 2 Theatre 3

U.S. public perceptions toward precision dairy technology

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Increased reliance on technology use in the dairy industry has come under public scrutiny, posing a potential threat to the industry's social sustainability if concerns cannot be reconciled. With increased interest in and use of precision dairy technologies (PDT) by producers, a clearer understanding of societal perceptions is needed. This study sought to characterize public perceptions toward PDT and describe how perceptions may be impacted by information framing about the potential effects of PDT use. In an online survey distributed to United States residents (n=2388), participants randomly received 1 of 8 vignettes, each containing either positively or negatively valenced information about hypothetical PDT impacts on data transparency, human-animal bond, and animal welfare. Here we present results of perceptions toward PDT as assessed via Likert item questions and open-ended questions before and after vignette exposure. Linear models were selected using backwards selection to assess significant predictors of baseline perceptions and shifts in perceptions about PDT. Baseline perceptions toward PDT were higher among men, rural participants, and dairy consumers ($p<0.05$). The valence of animal welfare information strongly predicted the direction of perception shifts ($p<0.001$), such that negative information was a 'deal-breaker,' resulting in worse perceptions of PDT even if participants received positive information about other attributes. Human-animal bond information was also influential ($p<0.05$), while data transparency information did not elicit significant shifts in PDT perceptions. Qualitative analysis reinforced these findings, with most responses including references to animal welfare implications as a key factor shaping perceptions of PDT. We suggest that the dairy industry will benefit from more closely engaging with public concerns around how PDT may impact animal welfare and the relationship between farmers and animals.

A hierarchy of care – An animal's social meaning impacts veterinary antimicrobial use

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Understanding the intricate relationship between an animal's social meaning and their veterinary care, including antimicrobial use (AMU), is pivotal for addressing global challenges of antimicrobial resistance (AMR). AMU will be closely scrutinised at the herd level following changes in the EU 2019/6 directive on veterinary medicinal products, impacting global trade in animal goods. This study employs social practice theory to investigate AMU in dairy cattle and dogs across Brazil, Spain, and Sweden. We elucidate how societal constructs shape veterinary practices through critically appraising national AMR programs and stakeholder interviews (vet students, clinicians, dairy farmers, and dog owners; n=82). Our findings show divergent meanings in animal care, influenced by species regional contexts and stakeholder interests, contingent on imposed subjective economic or social values. Caretakers, including veterinarians, owners, and farmers, play a central role in shaping these practices, with their perceptions impacting AMU decisions. Veterinary students challenge established practices, highlighting tensions between professional duties and societal expectations. Ethical uncertainties within the veterinary profession, amidst societal pressures, impact global career satisfaction. Resolving these tensions demands open discourse and holistic professional identities. This study underscores the importance of understanding the in-situ social significance of animals in veterinary practices, emphasising the welfare implications of AMU decisions. By integrating social theory with ethical considerations, we advocate for nuanced perspectives to navigate complex challenges in animal welfare and antimicrobial stewardship, contributing to interdisciplinary understanding and action. This research illuminates the care hierarchy in veterinary practice, showing the impact of animal social meaning on AMU practices and animal welfare.

A class practical to make vet students reconsider their health-biased view on farm animal welfare

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Animal welfare (AW) assessment schemes may critically depend on how AW is defined. There are 3 main views on the concept of AW: those that focus on basic health and functioning (Health), affective states (Feelings), or naturalness (Nature). The increase in the importance of Feelings in AW science seems poorly reflected in animal-based welfare assessment schemes that often are Health-biased. This may relate to the shortage of good indicators of the animals' Feelings compared to Health. It may also relate to people involved in such schemes having a Health-centered view. An example in place could be veterinarians who by training and profession are focused on Health, and who are intricately linked to the livestock industry and certification schemes. Vet students could thus be an interesting target for challenging their potentially Health-biased view. We present the effects of a 1h practical for 2nd Master vet students of Ghent University. The practical ran for 5 academic years (2018-2023) with 97 students. At the start they were informed about the 3 views on AW, and subsequently asked to allocate 30 points according to their personal opinion on the relevance of each of these views for AW. During the practical some examples of AW issues were presented and it was discussed which of the three aspects (Health – Feelings – Nature) were affected and how severely AW was affected. The students were then divided into groups (2-5 people) and asked to do the same for other welfare issues in which either the Feelings, Health or Nature of the animals was affected most. These examples were then presented to the entire class and discussed. They were then asked to allocate once more 30 points according to their opinion about the relevance of each view. To test the effect of the practical, the differences in scores allocated to each of the views at the beginning vs end of the practical were tested with a paired t-test. The students allocated more points to Feelings (11.44 vs 8.99, $P<0.001$) and fewer points to Health (11.71 vs 13.03, $P<0.001$) and Nature (6.84 vs 7.95, $P<0.01$) at the end vs beginning of the practical. The practical seemed effective in making vet students reconsider their Health-biased view on AW.

Session 2 Theatre 6

Official and private animal welfare inspectors' view of carrying out inspections

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An inspector's main task is to check for and enforce compliance with the relevant regulations. Having a trustworthy and effective control system is important both for animal welfare and for public confidence. The aim of this study was to investigate how official and private animal welfare inspectors in Sweden perceive their inspection work, and whether there are any differences in their perception. A digital questionnaire was distributed in which both official and private inspectors (Arlagården®, KRAV, Trotting Health Standard) were asked about their perception of carrying out inspections. A total of 108 official inspectors and 22 private inspectors responded. The data was first compiled using descriptive statistics. Pearson's chi-squared test or Fisher's exact test was used to investigate associations and differences. The official inspectors did inspect premises with all kind of animals (farm animals, horses, pets, laboratory animals etc.), while the private inspectors did inspect premises with farm animals or horses. Both the official and private inspectors carried out planned routine inspections. In addition to this, the official inspectors also carried out acute inspections when complaints have been received about animals in poor condition. In general, both official and private inspectors were happy with their work. However, official inspectors less frequently agreed that most inspected animal owners have a good way of keeping and managing their animals. The official inspectors had also experienced more threats (85%) and violence (21%), and one third of them said that this had influenced their judgement. Respondents stated that it is highly important that inspectors make consistent and uniform assessments, but just under half of them thought that they and their colleagues usually do so. Only 3% of the official inspectors agreed that official and private inspectors usually give the same assessment for similar requirements (e.g. on the same farm). Both groups asked for better cooperation between official and private inspectors.

Session 2 Theatre 7

Adaptation of Food Safety Auditing Principles to Train On-Farm Animal Welfare Evaluators

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Animal welfare assessment programs and on farm evaluations/audits have become commonplace for many commodities worldwide. Research on training of those responsible for on-farm assessments (e.g., evaluators, assessors, auditors) has primarily focused on testing the inter- and intra-observer reliability of specific animal-based measures used in an assessment, such as body condition and lameness. However, there are few published studies highlighting training approaches that can ensure that entire programs are reliably and reproducibly evaluated. Consistent implementation of an animal welfare assessment program relies on the ability of individual evaluators to collect and analyze evidence and determine if standards are being met on individual farms. Traditional approaches to training evaluators focus on providing trainees with examples of possible scenarios and discussions around possible outcomes; however, the limitation of this approach is obvious, since there are hundreds of possible scenarios that an evaluator might encounter in each year and only a small number of example scenarios can be provided in a training session. Beginning in 2020, the authors developed and adapted recognized food safety auditing principles to teach National Dairy FARM evaluators to consistently interpret on-farm situations across farm types, time of year and other factors. This model, Review, Observe, Verify, Report (ROVR), relies on recognized rules of evidence collection and the use of reliable evidence to determine evaluation outcomes. ROVR provides a systematic approach whereby evaluators can utilize a consistent thought process on farm when faced with an uncommon situation. ROVR relies on the recognized types of evidence widely used in food safety audits, such as interview, observation, and documentation. ROVR also relies on the ISO 9001 principle of a thorough document review and verification that farm standard operating procedures are being followed. The use of ROVR resulted in improved performance on certification exams of evaluators following training, as well as improvements observed during third party audits.

Dairy and beef industry perspectives on gene editing as assessed via the Responsible Innovation Framework

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Gene editing (GE) technology removes, adds, or alters genes to produce certain traits and is being increasingly investigated for use in farm animals. Technological innovation may outpace thoughtful reflection about technology use, including what GE technology means for animal welfare, farmers, and the future of farming. The purpose of this study was to understand how people who work with farm animals envision the future of the technology in agriculture and more broadly, society. We conducted fifteen interviews with Canadian dairy and beef industry partners, including farmers, breeding company representatives, and scientists. Interviews were structured using the Responsible Innovation Framework, discussing 1) responsibilities regarding GE development, 2) anticipated changes GE might bring to agriculture, and 3) whose voices (e.g., public, animals) should be included in the discussion. Participants diverged in their opinions about which applications (e.g., disease resistance, altering the "hornless" gene to create polled cattle) should be developed, but all considered how GE could help animals around the world become more resilient to environmental changes like increasing temperatures. Most saw value in including members of the public in discussions about technology development, and anticipated that increasing information about GE in the public sphere would also introduce more people to common farm animal management practices (e.g., dehorning). Participants expressed concerns about the ownership of certain GE applications, and felt companies were responsible for including farmer input in deciding which applications to develop. Many participants situated GE among breeding technologies that are now common (e.g., artificial insemination, selective breeding) and reflected on whether the adoption of GE would follow a similar path. Our results illustrate the diversity of perspectives regarding GE development within the dairy and beef industry, and can inform how decisions are made regarding future GE applications and how to plan meaningful engagement about GE and other agricultural technologies.

The PIGLOW app for welfare assessments by free-range and organic farmers: effects on pig welfare and opinions of pig farmers

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The PIGLOW app was developed within the PPILOW project to let organic and free-range pig farmers assess the welfare of their pigs. The app includes automated feedback and benchmarking. In a longitudinal study, 12 pig farmers used the PIGLOW app regularly during a 2-year period. Researchers conducted welfare assessments with 19 welfare indicators on each farm at the beginning and end of the study to determine the effect of long-term use of the app on animal welfare. Descriptive statistics showed a consistent improvement across farms for only 2 welfare indicators; "Scratches" ($\bar{x}$begin=3.20, $\bar{x}$end=1.60), for which the score represented the mean number of scratches per pig, and "Lameness" ($\bar{x}$begin=1.63, $\bar{x}$end=0), of which the severity for each pig was scored on a scale from 0 (best) to 100 (worst). While the data did not support an overall positive effect of the PIGLOW app on pig welfare, it is possible that a tool like PIGLOW is more likely to affect some welfare aspects than others. In addition, many welfare scores were already very good at the beginning of the study, which limited the potential for improvement. In a survey, the farmers were asked whether the use of the PIGLOW app had a positive effect on their opinions on pig welfare and on the welfare of their pigs. They rated this on a scale from 1 (not at all) to 7 (absolutely), where any score higher than 1 indicated an effect. On average, the farmers perceived a small to medium-sized effect of PIGLOW on their opinions on pig welfare ($\bar{x}$=4.00, SD=2.00) and the welfare of their pigs ($\bar{x}$=3.82, SD=1.60), with large differences between farmers. The farmers gave a good score for the app in general, with a mean rating of 8.09 (SD=1.38) out of 10. Open answers suggested that some farmers did not experience many benefits from the app themselves, but did see its potential for farmers with less knowledge of animal welfare. This project was funded by the European Union's Horizon 2020 research and innovation programme under grant agreement N°816172.

Session 2 Poster 10

Challenges and opportunities in cage-free egg production systems in Asia: perspectives from egg producers

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Asia-Pacific countries contribute nearly two-thirds of total global egg production. The shift towards cage-free production systems is gaining momentum in this region. However, this transition poses various challenges for egg producers. This exploratory study aims to understand the challenges faced by egg producers across Asia and explore proposed solutions and support needed to facilitate a successful transition from battery cage to cage-free systems. A total of 202 egg producers participated in this study and completed questionnaires. The producers were from Indonesia, China, the Philippines, Thailand, Japan, and Malaysia. The top three challenges faced by cage-free producers were the cost of production (22%), management of the system (14%), and disease prevention (14%). 81% of the participants believed that more support is required. The top solution proposed was to improve on-farm practices and efficiencies, with 36% of responses emphasising this aspect. The results indicate a need for support to improve on-farm practices, provide education and training, and enhance market access for cage-free producers across Asia. The findings contribute to the understanding of the dynamic egg industry in Asia and the potential areas for stakeholder support in transitioning to cage- free systems.

Session 2 Poster 11

Producer attitudes' affect perceived feasibility of collecting on-animal welfare data

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In Australia, a volunteer, producer-driven welfare benchmarking system has been explored as a way of incentivizing welfare improvement in pasture-based beef cattle and providing transparency and accountability to the industry. Importantly, measures included in such a system must be feasible for producers to collect. A survey was disseminated online to Australian adults in July 2020. Only respondents that had owned/worked on a pasture-based beef cattle farm in the last 10 years (producers) were included. Producers were asked to select the welfare aspects (n=59) they thought most important to check to determine if cattle on pasture-based farms have a good quality of life (QOL). Basic demographics and attitudes about the importance of QOL were also collected. Producers were then asked how feasible it would be for them to collect the following on-animal welfare data; body condition, weight, health, calving difficulties, heat stress and demeanour. Responses from 274 producers were included (52% male) with median land size 340 Ha (range 4-500,000) and herd size 200 head (2-200,000). The relationship between feasibility and demographics, attitudes and importance of welfare aspects were assessed using a Pearson's chi-squared test of independence and modelled by fitting GLMs with a Poisson distribution. Animals raised for food having a good QOL was reported as very important by 75% of producers and important/moderately important by 25%. Feasibility was not independent of QOL attitudes for 11 of the 17 on-animal measures ($P<0.01$-0.02), with feasibility perceived to be greater in those that rated QOL as very important. Feasibility was also not independent of the perceived importance of checking the corresponding welfare aspect. In all significant dependencies, feasibility was reported as greater in those that thought it important to check that welfare aspect. The feasibility of applying welfare measures on farm is an important consideration for the successful implementation of welfare benchmarking and a program to educate producers and improve attitudes will be crucial to increase uptake and retention.

Session 2 Poster 12

Animal welfare and ongoing farm consultances: how advisers' can increase the on farm animal welfare

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The development of welfare assessment plans has led farmers to become more aware of their animal breeding features and, over time, to improve general welfare. However, as these protocols are able to highlight the critical points found as individual and separate information, the farmer may not always be able to deduce the importance of the results obtained and, accordingly, the priority of improvement measures to be implemented. The mediation of a qualified consultant is therefore essential for their interpretation. The purpose of the study was to investigate the possible added value that direct and continuous support can have on animal welfare in dairy farms. The data collection was conducted on 21 dairy cow farms located in the south-east of Tuscany, Italy, using the Classyfarm protocol developed by the National Reference Centre of Animal Welfare (CReNBA). Each farm was evaluated 2 times at an interval of 3 months (T0 and T1), during which a targeted support was put in place to improve the negativities found. More than 60% of farms at the first screening obtained a just enough assessment sufficient, with an evident greater negative response in the area dedicated to management. All the farms showed instead an average increase of 22% on the total score in the second evaluation, with an average of 9 overall items improved per farms. The results obtained encourage and promote the importance of active, targeted and continued advice to farm operators.

Session 2 Poster 13

Stakeholder opinion and perception on feasibility of Cow-Calf on Italian dairy farms

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Animal welfare and environmental sustainability have been priorities in the EU, leading to initiatives like Green Deal and End the Cage Age. Calves being separated from dams early after birth is a concern, yet EU cow-calf contact (CCC) legislation is lacking. Several countries promote CCC systems, but there are still gaps in scientific knowledge and no gold standard, thus traditional farmers prefer their own methods. This study assessed Italian stakeholders' views on CCC as alternative to early separation. One-hundred stakeholders participated in a questionnaire-based survey to assess CCC opportunity and feasibility, the primary factors driving changes, and the business investments that they could support. Participants were 38.9±15.9 years old veterinarians, farmers, students, technicians/agronomists and others. Social aspects and technology were perceived as the main drivers of possible changes, scoring respectively 4.1±1.7 and 3.8±1.6 on a 0 (min) to 6 (max) scale, while product quality, sustainability, economy, and animal welfare received less importance. On a 0-5 scale CCC systems were rated 2.7±1.7 for opportunity and 2.2±1.5 for feasibility. Farmers perceived them as less feasible (1.27) than students (2.94), with intermediate values for veterinarians and technicians (p=0.001). Higher milk prices (3.8±1.2) and market demands (3.6±1.2) can drive the increase in ethical factors, while feeding and watering (3.8±1.1), structures and housing (3.7±1.2), and environmental control (3.6±1.3) were considered as suitable intervention areas to enhance ethical value of products. As potential investments, only providing extra space was supported by more than half of farmers (65%), followed by the adoption of selection gates (42%) and new housing layout (38%). Results show that stakeholders participating in the survey prioritize social concerns but also consider economic issues in the feasibility of CCC, although targeting their investments for welfare improvements. To ensure the applicability of CCC, it is critical to establish a common ground in which stakeholders can engage. CCC practices in Italy should be examined to build a roadmap that considers stakeholders and consumers' needs.

Is pair housing perceived by Italian stakeholders as an alternative to individual housing for pre-weaned calves?

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Phasing out individual housing of pre-weaned dairy calves highlights the need for feasible alternatives on-farm. Pair housing has been pointed out in literature, but little is known about how it is perceived by stakeholders. This work aimed at knowing Italian stakeholders' opinion towards pair housing (PH) as alternative to individual housing (IH) of pre-weaned calves. An online survey was sent to farmers (F), veterinarians (V) and farm technicians (T), between November 2023 and April 2024 (Ethics Committee approval no. 75/23). 4 multiple choice and 9 Likert scale questions were selected for the evaluation of alternatives and for rating the importance attributed to the advantages of IH and PH. Descriptive analysis was performed. 122 stakeholders answered the survey (F, n=33; V, n=65; T, n=24). Most farmers evaluated PH as an alternative to IH both to improve calves' welfare (88%) and as economically sustainable (88%). However, when asked if IH can be replaced by PH, only the 30% answered positively and the 48% agreed that it could be an intermediate phase between IH and group housing. Although fewer veterinarians and technicians perceived PH as an alternative both in terms of welfare improvement (66% V; 46% T) and economic sustainability (69% V; 63% T), they both agreed it can replace IH (66% V; 58% T) and be an intermediate phase (68% V; 67% T). Most farmers perceived important the advantages of IH (i.e. absence of cross-sucking, lower risk of respiratory and enteric disease spread; 78%, 88%, 91%), and less important the advantages of PH. On the contrary, no such cohesion was outlined in V and T, with different importance ratings given for the proposed advantages. These first results highlight the perception of PH as a possible alternative to IH, although discrepancies were found in stakeholders when asked if they agreed to replace it. Moreover, although advantages of IH were strongly perceived by farmers, a low perception of PH advantages was found, indicating the need for further knowledge dissemination in this field.

Plenary 3. The welfare of cull sows

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One characteristic of pig production is a high sow culling rate, leading to slaughter of almost half of the sows per herd each year. The welfare of cull sows is challenged by a decreasing number of slaughterhouses accepting sows, leading to increasing distances from farm to slaughter. In addition, cull sows are more prone to transport stress than market weight animals due to their clinical condition, sensitivity towards heat stress and transport stress. The ongoing genetic selection for large and high-prolific sows as well as increasing outdoor temperatures are likely hazards for the fitness of the animals for transport. However, management of cull sows, including the transport to an abattoir and the stay in lairage, have only received limited attention – scientific as well as in relation to the establishment of advice for best practice. In this presentation, I discuss welfare of sows in the last days of their life as well as examine potential welfare hazards and how these relate to on-farm, transporter and abattoir management decisions. I will do this by reviewing our recent work focusing on the particular animal category and studies relevant for the welfare of the sows. Among the studies presented are surveys of opinions and experiences reported by sow herd owners and livestock drivers, observations of behaviour and clinical condition of sows while kept in on-farm pick-up rooms and vehicles, studies of in-vehicle climatic condition in trucks transporting sows and studies of behaviour of cull sows in lairage. In addition, pre-transport management procedures such as fasting of the animals, will be discussed. Overall, the results suggest a complicated picture of risk factors for cull sow welfare, including for example pre-transport condition, in-vehicle temperatures, mixing with unfamiliar animals and journey duration – often in interaction. Thus, no factor alone seems to be the unequivocal causal factor, why adjustment of one or a few factors may not be a straightforward way to limit the burden of pre-slaughter transport for cull sows. Maintaining welfare of cull sows during the last days and hours of their life remains a societal challenge as well as a challenge for the professionals involved.

Insights into monitoring livestock on the move.

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Beef production involves the transportation of cattle to various locations for sale, finishing, and slaughter. These journeys expose animals to a range of stressors associated with curfews, novel environments, and handling, including fear, fatigue, dehydration, and metabolic compromise. Long-haul road transport is common practice in Western Australia with northern rangeland beef cattle subjected to journeys over 2,400km to reach processing facilities in the south, yet studies on the impact of such duration of travel is lacking. Australian federal regulations for adult cattle stipulate a maximum time off water to be 48 hours. This study developed a protocol for monitoring cattle undergoing transport and aimed to evaluate the effect of rest durations on welfare, using assessments of behaviour, demeanour, physiology, and meat quality. Bos indicus cattle (n=952) were assigned to short (18h), medium (42h), or long (64h) rest periods after approximately 36 h transport in a commercial setting. Using Factorial ANOVA, preliminary results of behavioural analysis at the rest stop and in lairage indicate any treatment effects were subtle. Cattle given long rest periods began to express normal patterns of maintenance behaviour (eating, drinking ruminating) compared to those given a short (~18 h) stay. Post-slaughter measures of blood markers analysed by GLMM indicated that most cattle had a physiological stress response, e.g., higher neutrophil count, which was more pronounced in the short treatment group ($p<0.05$). Additionally, urine was less dilute for cattle in short compared to long rest groups ($p < 0.001$). The duration of stay had minimal impact on meat quality. Results suggest longer rest periods may permit recovery from transport stress and optimise cattle welfare after long journeys, but further work is suggested.

Animal based measures of consciousness in improper stunned lambs

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To protect animal welfare at the time of killing, Reg. 1099/2009 (EC) states that animals must be stunned effectively. The aim of this study was to understand which animal-based measures (ABMs) – in case of improper stunning – are most likely to be observed and associated to each other. A total of 1941 improperly stunned lambs (incorrect placement of tongs and/or application time) of LW 6.3 kg were observed in an Italian industrial abattoir. Two cameras video recorded head-only electrical stunning, hoisting, and bleeding during an average post-cutting period up to 50s. Videos were analyzed using BORIS v.8.22.6. ABMs related to the presence of consciousness (presence of breathing, head-righting reflex, righting reflex, blink, vocalization, and movements of ears, head, eyes and nostrils) based on EFSA opinion (2021) and German SH training (Von Holleben, 2022) were evaluated by a trained observer. Descriptive analysis and Spearman's Rho correlation test were performed. The most commonly observed ABMs were nostril (38.9%), ear (38.6%) and head movements (25.1%). The 40% of the lambs did not exhibit any ABMs. These cases require further in-depth investigation to understand their level of consciousness. One case showed more than 7 ABMs, cases that showed more than 2, 3 or 4 ABMs were 43.5%, 31.3% and 19.1%, respectively. Nostril movements were significantly correlated ($P<0.001$) with breathing, eye, ear, and head movements, head-righting reflex, and righting reflex. The ear movements were significantly correlated ($P<0.001$) with blink, breathing, eye and head movements, head-righting reflex, and righting reflex. These results highlight how the animal's head can be a useful point to focus on when assessing effective stunning by ABMs, in terms of visibility and applicability. An automated solution informing the operator about the incorrect stunning would be beneficial in improving operators' training and lamb welfare at the time of killing.

Sheep Fatigue During Transport: Recognising Biases and Developing Methods of Identifying a Poorly Understood Welfare Problem

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Although sheep are transported long distances, and sheep welfare during transport is a topic of research and policy, sheep fatigue during transport is under-researched. Insight into stakeholder perceptions on sheep fatigue could help improve sheep welfare by identifying areas of and methods for further research. The qualitative study aimed to critically analyse stakeholder views on sheep fatigue, including the practical aspects of identifying fatigue in commercial transport conditions, behavioural indications of fatigue, and the interplay between fatigue and other factors. 18 experts from different stakeholder groups were interviewed (6 industry, 4 animal welfare scientists, 4 NGOs, 4 government) (33% of stakeholders have farmed sheep & 40% were also vets). Reflexive thematic analysis was applied to the interview data. This resulted in the development of four themes united by the idea that our views and approach to sheep fatigue in transport are based on anthropomorphic thinking. The theme "Fatigue 'never comes up'" confirms that fatigue, a potentially serious welfare problem, is not talked about by those working with and within the sheep transport industry. The theme "See the whole animal" contrasts the existing guidance on identifying sheep fatigue, focused on isolated behaviours, with participants' evocative descriptions of how the animal would be behaving when fatigued/fresh. This theme advocates using qualitative behaviour assessment ("QBA") to capture the meaning of animal behaviour in a more complete way to deepen our understanding of sheep fatigue. The remaining themes focus on the beneficial and pernicious aspects of anthropomorphism. QBA should be used to better understand how sheep experience and express fatigue. QBA has been used on-farm, is suitable for assessment of animal groups, and can be applied in transport. Finally, animalcentric anthropomorphism can help draw intelligent parallels between humans and sheep to spur research, influence public opinion, and drive policy change to improve sheep welfare.

Associations between on-truck monitor by sensors and Welfare Quality assessment during unloading and at the slaughterhouse in pigs

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The objective was to study the impacts of micro-climate conditions on truck and journey characteristics, on animal welfare, using Welfare Quality (WQ) assessment. Trips (n=103) were monitored. Sensors included a GPS tracker, DOL 114, and DOL 19. GPS tracker timestamped each stop. DOL 114 recorded temperature and humidity. DOL 19 recorded CO2 level. WQ assessment was conducted during unloading and on the carcasses: pig behaviors were recorded during unloading; skin lesions were assessed, and some clinical diseases were inspected on the viscerals of a subgroup of 60 carcasses per trip. Data were analyzed by correlation tests for preliminary overview. Humidity during transport was negatively associated with journey distance and duration (r=-0.33, P=0.01 and r=-0.27, P=0.04, respectively), as well as CO2 level during transport with journey distance and duration (r=-0.24, P=0.06 and r=-0.21, P=0.10, respectively). During unloading, pigs reluctant to move were associated with journey distance and duration (r=0.33, P=0.02 and r=0.29, P=0.04, respectively), whereas turning back pigs were associated with temperature and CO2 level during transport (r=0.80, P<0.001 and r=-0.48, P=0.01). The incidences of diseases were not associated with behaviors during unloading. Lesions on the middle and hindquarters were negatively associated with temperature during transport (r=-0.40, P=0.05 and r=-0.43, P=0.03, respectively). In conclusion, journey distance and duration can affect the micro-climate conditions on truck, and this may lead to fearful behaviors (i.e., reluctant to move or turning back) in pigs during unloading. Additionally, aggression during transport may be associated with micro-climate conditions on truck. Sensor technology applied on truck may have the potential to monitor animal welfare during transportation.

Session 3 Theatre 6

Unplanned culling and mortality in group housed sows – effects of housing and management

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In Sweden, sows and gilts have been housed in groups during both mating and gestation since the 1980s. Swedish pig producers thus have great experience and competence in handling the advantages and challenges with group housed sows. This study investigates the effects of housing and management on unplanned culling and mortality in group housed sows during mating (the 4 weeks following weaning) and gestation (from 4 weeks after weaning until next farrowing). Data on housing, management, culling and mortality were gathered from 37 piglet producing farms in Sweden. Detailed information on housing and management was documented at farm visits carried out from July 2022 to September 2023. Information on culling and mortality were retrieved from the herd monitoring system PigVision (AgroVision) for production years 2022 and 2023. Preliminary analyses (logistic regression models, fixed effects: parity, sow and gilt mixing or not, bedding type and group size) show that out of the 15 979 sows taken out of production on the included farms during the study period, 2 512 sows (15.7%) were not sent to slaughter. These sows were instead euthanized on the farm (11.2 %), or found dead (4.6%). The majority of the sows euthanized (83.5%) and found dead (72.6%) were taken out of production between weaning and farrowing, thus during the group housing period. The results show significantly ($p<0.001$) higher odds for early parity sows taken out of production during the group housing period (parity 1 and 2) to be euthanized or found dead than older sows that were more often sent to slaughter. During the gestation period, but not during the mating period, the risk for sows taken out of production to be euthanized was reduced in farms where sows were housed in groups with less than 20 sows ($p=0.018$) and in farms where sows and gilts were held separately ($p=0.058$). The results indicate that housing and management can have effects of practical relevance for unplanned culling and mortality in group housed sows.

Session 3 Theatre 7

The behavioural response of large swine to electrode attachment for on-farm euthanasia by one-step electrocution

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On-farm euthanasia methods should preferably minimize distress to pigs and humans. A common method, the captive bolt, may require stressful snare restraint and demands accuracy placing the shot, putting mental strain on stockpeople. One-step electrocution could be a less stressful method where in a small pen, two electrodes are attached to the pig and current supplied. Electrode application should be accepted by pigs and user-friendly. The aim of this study was to evaluate the behavioural response of pigs to electrode attachment and the ease of application. Sixty sows (parity 2.73 ± 1.36, mean ± SD) and 40 finisher pigs (98.4 ± 15.3 kg) were determined to be calm or fearful via a human approach test, then in a pen (3m2), received three electrode treatments (BB: chain bridle and belt; CET: copper clamps on ear and tail; CFL: clamps on flank and lip) and control (sham handled without attachments) in a crossover design. The pig behavioural response to each treatment was scored (0: accepting, 1: tolerant; 2: mildly aversive, 3: highly aversive). To evaluate ease of application, the time (seconds) and number of attempts (three max) to successfully attach both electrodes were recorded. Preliminary results from analysis of the first treatment received show that the time to attach both electrodes was lower for CET and CFL compared to BB in both sows: $8.7\pm1.8_a$; $12.2\pm1.9_a$; $25.9\pm1.9_b$ s (mean ± SEM), respectively $p<0.001$, and finishers: $11.8 \pm 1.9_a$, $12.6 \pm 2.1_a$, $21.7 \pm 1.9_b$ s, $p=0.002$. Electrode combinations did not differ in the number of attempts to attach. The behavioural response to electrode attachments did not differ to CON (sows: $p=0.145$; finishers $p=0.414$) where 93% of sows and 90% of finishers that received CON scored 0 or 1, and fear of humans had no effect. The behavioural response of swine to any electrode combination is similar to sham handling. Considering ease of application, clamps are quicker to apply.

Assessment of fitness for slaughter in dairy herds - A questionnaire survey among dairy farmers in Denmark

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In Denmark, more than 10,000 cows are euthanized annually in the dairy herds because of various diseases and injuries. These cows are sent for rendering and thus not used for human consumption. The main purpose of this pilot study was to investigate the number and cause of euthanized cows that staff in the dairy herds consider fit for slaughter. The present study was based on answers to 15 online distributed survey questions, mainly questions with predefined response options, related to handling of sick/injured cows, e.g. consultation with a veterinarian about fitness for transport or slaughter and number and reason for home slaughter. The questionnaire survey was distributed via a newsletter from one slaughterhouse company and via social media. Since the number of potential respondents was unknown, the response rate was not calculated. The respondents (n=79) half of whom described themselves as herd owners, estimated that almost half of the euthanized cows, that had been sent for rendering within a year, had been fit for slaughter, with locomotor disorder (63%) or ”accident” (46%) stated as the most frequent causes. Locomotor disorders and ”accident” were also cited as frequent causes of home slaughter, and doubts about being fit for transportation. Almost half of the respondents reported having sent cows for slaughter with doubts about whether the cows were fit for transportation. The sample of respondent in the present study is small and the degree of its representativeness is unknown, which means that the results of the survey should be interpreted with some caution. If larger follow-up studies show similar findings, these results suggest that many euthanized cows are fit for slaughter which leads to animal welfare dilemmas, food waste and economic consequences. This indicates a strong need for more focus in this area, to establish more sustainable practices for cattle production.

Using AI to evaluate CO2- stunning under commercial settings

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Several studies concerning stunning methods for pigs are carried out to investigate whether it is possible to optimize exposure to carbon dioxide (CO2) in high concentration (>80%) or use alternative gases or gas mixtures. To evaluate the pig’s response to a given gas the typical approach is to observe the pig’s behavior before loss of consciousness. Under commercial conditions pigs are typically stunned in gondola in a dark pit with a limited possibility to make a visual inspection. Consequently, in the existing scientific literature, the experiments on gas stunning are often performed on a smaller group of animals in set-ups that allow for a visual inspection. To be able to assess the pig’s response under commercial conditions a vision system using AI was developed to measure activity level of all pigs in the gondola. With this measurement the individual aspect is lost, nevertheless, the total activity of the pigs provides usable indications on how the stunning has progressed. Overview of each gondola during stunning was recorded using a custom-made GoPro camera. The camera was mounted on the top rails in the center of the gondola with a top-down view. For each gondola was recorded the level of activity per time unit using an artificial intelligence model to evaluate relative change in pigs’ position between video frames. Activity level was calculated from segmented frames isolating only pixels containing pigs. The system was preliminary validated by testing the output against video-observation of 30 gondolas. The observations were made in gondolas, for which the recording of activity, measured by the AI model, spread over numerically high, intermediate, and low activity level. A subjective assessment was done of the recordings using a categorisation of severity grading as mild, moderate, significant, or intense. The video observation was done by two trained observers. The measured activity was coherent with the grading of severity done by observers. In conclusion, the AI model was able to analyze activity level (as indicator of negative welfare) and could therefore, be a useful tool to address the difficulty of evaluating pigs during the stunning process both during research and under commercial settings.

Session 3 Poster 10

Changes over time in physiological responses of steers after long distance transportation

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Prolonged disturbance of physiological indicators such as serum parameters may lead to poor health of the animal and reduced animal welfare status. The objective of this study was to investigate physiological changes of steers after long distance transport in Japan. 18 Japanese Black steers (12 at August, 6 at September) were transported by ferry and truck. Transported age was 8.4 ± 0.7 months. The total transport distance was about 1,200 km, first 600 km was transported by truck and ferry, and last 600 km was by truck. Last 600km transport took 9hrs taking 30min rest every 4h. After arriving at the farm, steers grouped into 4 heads each (5.0 m2 / head). Blood sampling was carried out in the current day that steers were transported into the farm, as well as 1 week and 1 month later. To examine trends over time for physiological responses, each measurement was subjected to a generalised linear model with sampling day and month of transportation as explanatory variable. If the effects were significant, post-hoc tests were performed with the Tukey's studentized range test. Serum AST, BUN, T3 and vitamin A decreased in a week ($P < 0.01$). Serum glucose and total cholesterol did not change in a week, but decreased after a month ($P < 0.01$). Serum total protein, ALT, triglyceride changed over time, from one week to one month later ($P < 0.01$). In this study, any steers in morbid condition was observed at the day of transported, although the effects of lack of food and water during transport were observed. However, the time of settling down may vary depending on physiological measurement.

Session 3 Poster 11

Bruises characterization in beef cattle through innovative forensic techniques

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Bruises are very good indicators of animal welfare and represent an economic lost, due to decreased carcass yield and potential devaluing of cuts. According to the fourth Uruguayan Beef Quality Audit developed during 2023, 76,4% of the carcasses had at least one bruise and 23% had at least one bruise affecting muscle, being 31% of the total annually meat chain losses. Knowing their age and therefore where they occur would help to improve this important problem through training and education of the relevant actors. The aim of this study was to characterize bruises of diverse known ages, through different technologies. One bruise per steer (n=60) was inflicted at the farm by an ad hoc mechanical device, affecting muscle at the rump region after applying local anesthesia. Bruises were inflicted at 6 preslaughter times or Treatments (T): T1: 1 hour, T2: 5, T3: 9, T4: 13, T5: 17 and T6: 23 hours. After slaughter, diverse pathological reactions were registered at the abattoir and one sample per bruise was extracted for histological analysis. Neither subjective (Gracey´s visual scale) nor objective color (L*, a*, b*) differed between T. Elasticity of muscle fibers differ between healthy and affected tissue ($p<0,05$), but not between T. Infrared thermography showed that differences in temperature between healthy and affected tissues from the same muscle, were greater in older bruises ($p<0,05$) appearing to be a promissory tool. The presence of inflammatory infiltrate and its location, as well as the presence of edema, did not differ between T. Fibrosis was not observed. Necrosis, defined as irreversible cell damage, was measured by a 0 (absence) to 3 scale, being 3 the more severe damage. Grade 2 was registered only in T5 and T6, but grade 3 only in T6. In summary, elastography detected differences between healthy and damaged tissue, but only infrared thermography and necrosis were associated to bruises age, and further research is being conducted on this topic.

Session 4 Theatre 1

Plenary 4. Lifting farm animal lives – laying the foundations for positive animal welfare

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The focus in animal welfare is shifting from a predominant focus on minimising suffering towards also promoting positive experiences and a good life. This novel focus has led to an increase in the investigation of positive mental states and positive animal welfare (PAW). Many key questions remain: What exactly is PAW? What are sound methods to assess PAW? What are valid indicators of PAW for on-farm assessment? Positive animal welfare better aligns with public expectations, but there is a risk that the concept becomes devalued, unless it truly helps to improve animal welfare. The COST Action LIFT (2022-2026) is a global multi-disciplinary scientific network, that aims to lay the foundations for PAW science through collaborations, meetings, training schools and mobility. The work is carried out in four working groups (WGs): WG1 aims to define and understand key concepts of PAW; WG2 aims to identify valid methodologies to assess PAW; WG3 aims to propose PAW indicators for on-farm assessment, and WG4 aims to disseminate the findings of the Action. WG1 produces conceptual and review articles and has now concluded that PAW can be defined as the animal flourishing through the experience of predominantly positive mental states and the development of competence and resilience. WG2 produces a catalogue of indicators previously suggested to assess PAW, review articles into specific methods to assess PAW, codes of good research practice for PAW research, and a research forum providing an overview of the skills of LIFT members. WG3 takes the work of WG2 further by identifying valid indicators for on-farm welfare assessment and matching these with stakeholders' needs through active consultation. The results are disseminated by WG4 through newsletters, website, social media and scientific workshops.

Session 4 Theatre 2

Reliability and validity of the Qualitative Behaviour Assessment – a systematic review

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Qualitative Behaviour Assessment (QBA) was first mentioned in literature in 2000 and has since been used as method to measure animals' emotional state. It relies on the ability of human observers to capture the demeanour of animals' behaviour based on qualitative descriptors such as "relaxed" or "tense". Despite being widely used, e.g. in welfare assessment protocols, there is still on-going debate on reliability and validity of QBA. Therefore, this systematic review aims to identify all studies that have utilised QBA, focusing on the fixed-list approach, and moreover to investigate current evidence of reliability and validity as well as which methodological parameters affect this. 200 original research articles were included for review, of which a majority were on cattle (65), followed by pigs (43), poultry (only hens, 22), sheep and goats (22), horses and donkeys (18), dogs and cats (16), fish and wild animals (mainly in zoos) (14). 102 articles reported results on validity of QBA and 74 reported results on reliability. In total, 22 articles reported QBA as valid, while 18 articles found no evidence of validity and 62 came to inconclusive results or being partly valid. We found articles working with dogs, as well as articles observing animals individually (instead of group level), to more often find evidence of validity. When articles concurrently reported on reliability of the QBA, the chances of establishing validity were higher. However, if principal component analysis was used, but data suitability criteria were not met, or if low or no threshold values for factor loadings were set, chances for establishing validity of the QBA were higher, suggesting that shortcomings in data analysis and interpretation of results exist. Reliability depended on whether the observations were carried out directly or by video recordings (video recording increased reliability) as well as undertaking training of the observers (higher reliability was reached when observers were trained). Overall, this review highlights the need for a thorough recapitulation in the procedure of how the QBA is being carried out (e.g. training level of observers) as well as in the statistical analysis and interpretation of QBA results.

To sleep or not to sleep: Reliability of the assessment of vigiliance stages

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Measuring farm animal welfare is an ongoing challenge, especially when considering the multidimensional concept, including subjective and emotional perceptions. In human studies, the quality of sleep is a well-established indicator of welfare. However, little is known about the relationship between sleep and welfare in livestock. Polysomnographic measurements, considered the gold standard in human research, offer a promising approach for non-invasive sleep assessment (electroencephalogram (EEG), electrooculogram (EOG), electromyogram (EMG)) in free moving animals under realistic husbandry conditions. In order to establish such techniques, reliability and validity of the method and the analysis is pivotal. This study presents initial findings on the reliability of polysomnographic data analysis, measuring sleep in 12-13 days old calves. Four EEG electrodes (2 frontal, 2 occipital) were positioned on the forehead, while EOG and EMG activity were captured using electrodes at the eye corners and neck, respectively. Data were recorded using the SomnoScreen mobile sleep lab. Measurements of five calves were analyzed using the Domino software, with a 5-hour time window from 10pm to 3am assessed by three observers. The state of vigiliance was distinguished by three sleep stages (REM, non-REM 1; nonREM 2) and being awake. Krippendorff's alpha for ordinal data was calculated for all three observers and all possible pairwise comparisons between observers (observations: n=9015). The Krippendorff's alpha ranged between -0.08 and 0.79 when including all vigiliance stages. Calculating observer reliabilities for sleep stages only (n=3824) resulted in values ranging between 0,73 and 0,76. These results show, that defining sleep stages as done in our study, the reliability was good for the three sleep stages. However, sleep might be under-/ overestimated when including phases where animals were scored to be awake. Therefore, data analysis has to be validated further in order to assess sleep in a reliable way. Understanding the sleep patterns and needs of livestock is one step forward to ensure animal welfare in farm animals.

Exploration of positive social relationships in group-housed gestating sows

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Social behaviour constitutes a crucial aspect of positive animal welfare in farm animals. While preferential relationships for positive social interactions have been reported in ruminants, like cows and sheep, evidence for their existence in pigs is limited, despite potentially significant implications for their welfare. We aimed to assess whether group-housed sows had preferential partners for positive social interactions and whether individual attributes influenced these preferences. We used four groups of gestating sows comprising 17 to 19 sows from various parities and dominance ranks. Two groups were housed in a barren environment and two groups were housed in a larger environment with straw bedding. We continuously recorded emitted and received socio-positive interactions, including body exploration (i.e. nosing and grooming body) and snout-to-snout contacts, on video recordings for three hours/day on five consecutive days at the end of gestation. Social interactions were averaged over the five days and expressed as counts/hour. A total of 2831 social interactions (averaging 40 ± 3.7 interactions/sow) were scored. Sows engaged in an average of 2.76 ± 0.25 socio-positive interactions/hour, comprising 2.07 ± 0.20 body exploration and 0.69 ± 0.06 snout-to-snout contacts/hour. Low-parity sows displayed more body exploration than primiparous and high-parity sows ($p < 0.001$), and engaged in more snout-to-snout contacts than high-parity sows ($p = 0.04$). Sows in a barren environment displayed more snout-to-snout contacts than sows in an enriched environment ($p = 0.02$), with no difference observed in body exploration. Using social network analysis methods and permutation tests, we identified non-random dyadic associations for both body exploration and snout-to-snout contacts in all four groups of sows. While dominance did not affect social preferences, sows preferred to explore sows from the same parity class in most groups. Networks for body exploration and snout-to-snout contacts were highly correlated. In summary, our study highlights the presence of preferential relationships for socio-positive contacts within groups of gestating sows, influenced in part by parity. Incorporating these relationships into management practices could be pivotal in enhancing the welfare of sows on farms.

Improving the Rearing Environment for Laying Hens: Balancing Stimulating and Secure Functional areas

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Laying hens are reared in environments that protect them from harm, yet the birds may not perceive that they are in a safe environment, and provision of designated sheltered areas is often lacking in commercial systems. In our study, we explored how offering different functional areas within the rearing environment influenced behaviours associated with a heightened sense of security in laying hens. We hypothesized that creating a secure base within a stimulating rearing environment would enhance the pullets' perception of security and promote exploration. To test this hypothesis, we conducted a 2×2 factorial experiment utilizing distinct functional areas. Our findings revealed that providing a sheltered area with a dark brooder during early rearing led to shorter latencies in a detour test ($P<0.01$) and increased comfort behaviours in a novel environment ($P<0.05$), indicating better spatial skills and an enhanced feeling of security among the birds. Moreover, birds with access to a stimulating area featuring various litter types engaged more in foraging behaviour ($P<0.01$), compared to those without access. Additionally, birds with both a secure and stimulating environment were more evenly distributed within the pen, while those with access to either a stimulating or sheltered area tended to spend the majority of their time within the respective functional area provided ($P<0.05$). In conclusion, our study suggests that providing laying hens with the opportunity to move between different environmental conditions, such as a secure sheltered area and a stimulating area, fosters behaviours associated with positive welfare.

Behavioural complexity in pigs: Video- and 3D accelerometer-based measurement for the development of a novel welfare indicator

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Our objective was to develop a procedure to aggregate 12 behavioural indicators into a condensed individual-based measure of behavioural complexity. We therefore previously validated the procedure theoretically (Raudies and Gygax under publication). We now further validated this procedure and the complexity measure with real-life behavioural sequences of fattening pigs residing in various housing systems. We also tested this approach on sequences of low and high activity states derived from accelerometer data. We anticipate observing higher behavioural complexity in semi-natural housing environments compared to intensive conventional housing systems. We therefore continuously analysed 2616 hours of video for 214 pigs of four different housing systems. At the moment, approx. 50% of the videos have been analysed. The results of the PCA show that 66% of the variance in behavioural complexity can be explained by the two first components. A linear mixed model showed that component 1 increased with higher housing levels ($p = 0.015$) and decreased with age ($p = 0.004$). The season had no effect on component. At the current state of analysis, other effects or interactions could not be statistically supported. The acceleration data comprised 185 24-h sections from 97 fattening pigs.The result of the PCA was that the five behavioural complexity variables loaded strongly (> 0.25) on either the first ('general complexity') or the second component ('transitional variability'; or both). There was an increasing general complexity with increasing housing level ($p = 0.01$) and a tendency for this effect to increase with increasing age ($p = 0.06$). There was no statistical confirmation of an effect of season on overall complexity ($p > 0.31$). There was a tendency for a higher value in 'transition variability' with increasing posture level ($p = 0.08$), but there was no statistical confirmation for an effect of age ($p > 0.27$) and season ($p > 0.23$). Even at this stage with the limited amount of analysed video data, these results indicate that the more animal-friendly the husbandry environment, the higher the behavioural complexity observed.

QBA and indicators of positive emotions in cattle

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There is increasing interest in developing animal welfare protocols that not only assess if animals are suffering, but also include an assessment of their positive emotions. It is notoriously difficult to validate indicators of emotions, but one approach is to use concurrent validation and assess to what extent potential indicators correlate. One indicator that is often proposed to measure emotions in animals, including positive emotions, is qualitative behaviour assessment (QBA). In the current study, the correlations between QBA and four different groups of behavioural indicators of positive emotions identified in a previous review were assessed. Thirty-one Swedish dairy cattle farms were visited and the occurrence of synchrony (lying, feeding and loafing), grooming (self-grooming, allogrooming and brush use), ear position (ears back-up, ears back-down) and play were registered. Following the Welfare Quality® protocol, a QBA was carried out, using the descriptors from the protocol, and the QBA measure of the valence for the animals on each farm was calculated. None of the synchrony measures correlated significantly with the valence measure of the QBA (p=0.24-0.41). Allogrooming (Rs=0.64, p=

Don't rub the belly of a boar: Pigs' behavioral response to human contact and abdominal stroking

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Human-animal contact is an important aspect in improving animal welfare, as positive contact can reduce stress. Pigs generally perceive gentle abdominal stroking (i.e. belly rubbing) as positive, but only some pigs allow such contact. We aimed to better understand what underlies the difference in this responsiveness. We studied 22 pigs (8 pregnant females, 14 entire males) between 7-11 months of age. Boars and gilts were housed in groups of 3 or kept mostly solitary. We hypothesized that solitary housed pigs would be more responsive to human contact. For two weeks they were daily habituated, after which they were tested for their response to 10 minutes of belly rubbing. Data were analysed in mixed models with binary distribution, while accounting for sex, age, housing and batch. In this preliminary data, housing treatment did not have an effect on the response to abdominal stroking (p=0.74). However, response to human contact strongly depended on sex (p=0.0018); all gilts could be touched for 10 minutes whereas only 50% of boars allowed any type of contact for 10 minutes. Voluntary lying down for abdominal stroking was seen in 87.5% of gilts and only in 21% of boars. Behavioural observations shows that the boars were more aggressive, regardless of having equal experiences to human contact. The pigs that did lie down showed eye closure and limb stretching in 100% of occasions. There was no effect of age (p=0.11). The current data shows that gilts are more tolerant to human touch than boars, while the effect of housing conditions will need to be confirmed on a larger sample. The results suggest that implementing measures could lead to more positive interactions and welfare outcomes for both humans and animals involved in agricultural practices.

An exploratory study on how separating and reuniting familiar pigs may impact pig welfare

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Mixing pigs with unfamiliar conspecifics often leads to aggression, compromising pig welfare. However, the impact of separating and subsequently reuniting a group of familiar pigs remains understudied. This study assessed the consequences of such social restructuring. At weaning, five groups of 18 pigs (replicated over time) were reared in a partly-slatted, straw-bedded pen for 4 weeks (BASELINE). Each group was then separated into 3 sub-groups of 6 pigs in new pens for 7d (SEPARATION), and then reunited (REUNION). Social behaviours were collected during the 3 phases. Saliva samples were collected at SEPARATION/24h post-SEPARATION/at REUNION/24h post-REUNION and analysed for oxytocin concentration. Lesion scores were also recorded at these 4 time points, plus at weaning, post-weaning and 1 week post-weaning. Data were analysed using Mixed Models, considering the effect of collection time. Non-agonistic nosing of the head/nose during REUNION was less frequent than BASELINE ($P < 0.01$) and tended to be less frequent than SEPARATION ($p = 0.07$). Skin lesions were higher post-REUNION than all other time points ($P < 0.001$), but lower than post-weaning ($P < 0.001$). Salivary oxytocin, play and aggression did not differ between time points. The preliminary results suggest that after 1 week of separation without mixing with unfamiliar pigs, there were some disruptions in pig social behaviour. The injury risk increased without more aggression observed and did not reach the level of post-weaning mixing. In situations where injured/sick pigs need to be removed for treatment, regrouping with familiar pigs within 1 week is a better strategy with regard to pig welfare than mixing with unfamiliar pigs.

Development of qualitative behavioural assessment of mink

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Several welfare assessment systems include Qualitative behavioural assessment (QBA) as an indicator of welfare in the assessment of the animals' welfare (AWIN, 2015; Stubsjoen et al., 2022, Welfare Quality, 2023). QBA of animals is an assessment of the animal's behavioural expression including positive aspects, reflecting the animals experience of their surroundings. The aim of the present study was to develop a QBA indicator to be used in the welfare assessment WelFur-Mink, including development of a fixed QBA descriptor list useable for groups of minks and the test of inter- and intra-observer reliability. A keyperson group of in total 14 experts within mink farming including researchers, production veterinarians, consultants and WelFur assessors, were in a delphi questionnaire asked to 1) identify and 2) prioritise descriptors for a QBA protocol that would best cover all possible behavioural expressions of mink for each of the 3 observation periods (P) included in WelFur-Mink: P1 'Winter'; January – February (adult breeder animals), P2 'Reproduction' May-June (adult animals with kits), and P3 'Growth'; September-November (adult animals and juveniles. This process resulted in 29 QBA descriptors for P1, 31 for P2 and 29 for P3 which were all prioritized by at least four keypersons. To evaluate the inter- and intra-observer reliability of a QBA for mink, there were conducted two separate on-line sessions with experienced WelFur assessors, for training and test of intra and inter observer-agreement (IntraOR and InterOR) of QBA measurement for P1. Based on video footage 8 observers QBA assessed 15 short videos of mink randomely 2 times. Preliminary analyses show that the IntraOR was found to be high and that the interOR was medium to high. References AWIN 2015. AWIN Welfare assessment protocol for sheep. DOI: 10.13130/ AWIN_SHEEP_2015 Stubsjoen, S.M., Moe, R.O., Mejdell, C.M., Tommerberg, V., Knappe-Poindecker, M., Kampen, A.H., Granquist, E.G., Muri, K., 2022. Sheep welfare in different housing systems in South Norway. Small Ruminant Research 214. Welfare Quality, 2023. Welfare Quality assessment protocol for cattle. Version 3.0. Welfare Quality Network.

Session 4 Poster 11

Better sow housing during lactation promotes piglet social play behaviour, indicating positive welfare in piglets

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Play in young farm animals is a candidate indicator of positive animal welfare. So far it is unclear whether improved housing conditions for lactating sows increase piglet play behaviour and could indicate enhanced positive animal welfare for piglets. Permanent crating during lactation impairs sow welfare. Temporary crating, with the sow being only confined over the first 3-4 days post-partum, is more acceptable. It is unknown whether piglet play behaviour is higher in temporary compared to permanent crating system. This study compared piglet play behaviour at day 25 post-partum in 10 litters housed in temporary crating with 10 litters housed with permanently crated sows. Piglet play was counted every 10 min for 16 hours. Solitary play, social play and play with mother was quantified as mean per piglet. Solitary play did not differ between housing systems but social play (t-test, n= 10 versus 10, t=-2,92, $P<0.01$) and play with mother (t=-2,39, $P<0.05$) were higher in temporary crating. The results indicate that social play among littermates and with the mother is increased by providing better housing for the sow. Thus, positive animal welfare is promoted in sucking piglets through giving the lactating mother free movement within days after birth.

Session 4 Poster 12

Preliminary results from an Exploratory Factor Analysis of Qualitative Behaviour Assessment data in blue foxes

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Qualitative Behaviour Assessment (QBA) is a commonly used method for assessing positive emotional state of farm animals. The development process of QBA for an animal species consists of several steps from selecting the adjectives that cover the expression of emotional state in the species in question to converting the results into an easy-to-understand welfare interpretation. We present here results from an Expolatory Factor Analysis (EFA) of a QBA dataset from blue foxes, a species for which the QBA development is at an early stage. Fifteen videoclips (1-2 min) were collected from European blue fox farms with varying housing conditions (area of cages, number of animals per cage, level of enrichment). Eleven assessors assessed the videos twice using 27 pre-selected adjectives recorded on a 125 mm Visual Analogue Scale. The average of the millimeters from these two recordings for each assessor was used in an EFA (SAS statistical software) with a principal factors procedure. We used oblique rotation technique since we did not have any theoretical reason to expect that the factors could not be correlated. Five factors (FA1-5) were extracted with factor loading (all positive) ranges as follows. FA1: Boisterous, Playful, Energetic, Active, Positively occupied, Lively, Sociable and Aggressive (loading ranges 0.94 – 0.46, respectively) ; FA2: Agitated, Nervous, Fearful, Cautious, Alert, Stressed (0.83 – 0.57); FA3: Curious, Bold, Exploratory and Responsive (0.93 – 0.50); FA4: Relaxed, Content, Drowsy, Indifferent, Confident and Calm (0.80 – 0.50); FA5: Frustrated, Uncomfortable and Bored (0.80 – 0.59). Factors 1 and 3 were positively (+0.47) and Factors 2 and 4 negatively (-0.44) correlated. The remaining correlations ranged from -0.15 to +0.19. The factor solution was easy to interpret in terms of positive and negative emotional states: FA1, FA3 and FA4 reflect positive and FA2 and FA5 negative emotional state. The interpretation remains to be verified or falsified with larger and more diverse data sets.

Session 5 Theatre 1

Plenary 5. Quantifying Animal Welfare to Inform Policy

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Policymakers face complex trade-offs between human and animal welfare. Although there are well-developed quantitative tools for incorporating human welfare into policy analysis, comparable tools for animal welfare are in their earliest stages. Without them, it is impossible to assess the net impacts of policies on a common scale; instead, policymakers are left with human impacts on one side of the ledger, impacts on animals on the other, and no obvious way to strike a principled balance between them. In practice, then, animal welfare is often neglected. Given that animal welfare matters in many cases, there is an urgent need for best-practice methods for integrating animal welfare into quantitative decision analyses. This talk discusses strategies for making progress. Some methods focus on anthropocentric valuations of animal welfare, such as consumer willingness to pay for given welfare improvements. Unfortunately, consumers' valuations of animals are highly context-dependent and often impossible to aggregate, as in any particular study, some number of consumers will indicate that humans are infinitely more important than animals, complicating any standard method for averaging responses. Accordingly, there is increasing interest in trying to provide intrinsic valuations of animal welfare by combining measurable empirical indicators that may be correlated with welfare potential across species, where welfare potential is a measure of how well and poorly off an individual of a given species can be compared to humans. Estimates of welfare potential might be based on hypothesized neural or other proxies for conscious states, cognitive and behavioral traits, or more complex multidimensional proxies. Analogous methods are used in economics to define functions from income (or other proxies) to individual human welfare. Though they are imperfect and must be used judiciously, keeping broader moral, legal, and political considerations in mind, such proxies can be valuable tools in some decision contexts.

Session 5 Theatre 2

Animal welfare science: views from the field

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Improving the lives of animals is a core aim of animal welfare science (AWS). But 'improve' is a vague directorate, open to interpretation influenced by ethics, beliefs and pressures from vocal stakeholders. Given this, we identified a need for data and discussion on AWS' specific aims, on how well it is meeting them, and why.We surveyed 327 active animal welfare researchers from 42 countries and asked them: What should AWS aim to do? How do you feel others in the field see its aims? How do you prioritise your research projects? How do you feel others in the field prioritise their research projects? Which, if any, problems hold AWS back from meeting its aims? And, What do you feel is the most important change to make in AWS to help it function better? We found a perceived disconnect in aims: respondents ranked 'promoting positive welfare states' ($p=0.006$) and 'producing radical positive change in the lives of animals' ($p<0.001$) as more important to themselves than to the field, and ranked 'ameliorating the worst animal welfare problems through incremental changes' ($p<0.001$) and 'helping owners of animals' ($p<0.001$) as more important to the field than to themselves. So too was there a perceived disconnect in priorities: respondents ranked themselves as prioritising the 'seriousness of a welfare problem to the animal' ($p<0.001$) and 'intrinsic scientific interest' ($p<0.001$) more than the field does. They considered the 'relevance to the general public' ($p<0.001$), 'fit with funding mandates' ($p<0.001$) and 'seriousness of welfare problem to the industry' ($p<0.001$) to be prioritised more by the field. Top ranked problems facing AWS were 'failure to achieve industry uptake' (74%), 'validating indicators of welfare' (65%), and 'failure to influence policy change' (60%). Recommended changes to AWS were given in free-text boxes and included asking for: better communication with policy makers (8%), radically changing society's attitudes and ethics regarding other animals (8%), improving the scientific quality of AWS (7%) improving the AWS community (7%), and increasing the availability of industry-independent funding (6%). We hope our results stimulate discussion of what AWS is here for, and how it may be being held back.

Session 5 Theatre 3

What should future animal farming look like?: reconciling the environmental and animal welfare implications of animal farming

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Attempts to improve welfare are taking place within the context of the fairly polarised debate between those who believe the detrimental environmental impacts of intensive agriculture can be addressed by technological solutions and those who advocate a transformative approach in which we shift to regenerative farming such as integrated crop-livestock systems. There is increasing reliance in animal farming – and the production of cereals for feed – on techno-fixes to address problems such as air pollution. This is taking us increasingly into large-scale industrial farming in which the potential for good welfare is limited. For example, the recent report Appetite for change – the 2nd European Nitrogen Assessment Special Report on Nitrogen & Food says "In general, increasing NUE [nitrogen use efficiency] requires gaining more control over the nitrogen flows. Some measures, such as an increased used of livestock confinement, will impact other policy areas (e.g., animal welfare)." Many of livestock's environmental problems stem from the production of cereals as feed. Studies show that 98% of livestock's water footprint stems from feed production, which is also responsible for 99% of broilers' land use. 81% and 50% of broilers' and pigs' GHG emissions respectively arise from production of feed. We need to rethink feed. Animals only make an efficient contribution to food security when they convert materials we cannot consume into food we can eat. Animals should mainly be fed on grass, crop residues, by-products and unavoidable food waste. Using slow growing broilers and reducing stocking density requires more land. To raise broilers to a slaughter age of 56 days at a density of 25kg/m2 would – if no more land is to be used than at present – require a 35% reduction in EU production. Such a reduction is modest compared with the >50% reduction in meat production in high-income countries which is recommended by several studies on health, climate and environmental grounds. Finally, we need a major push to get high welfare standards recognised as being an inherent component of good food systems and an intrinsic element of sustainability.

Session 5 Theatre 4

Dairy quality assurance on an international scale: What do we know and where are we headed?

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The concern for dairy cattle health and welfare worldwide has led to the development of many different types of quality assurance (QA) programs for animal care. Our objective was to investigate differences in goals, structure, and impacts of QA programs. A landscape review was conducted to identify prominent dairy QA programs in North America, Europe, the U.K., Australia, and New Zealand. A framework was then developed to systematically review each program's structure, standards, and evaluation process using publicly available information. A total of 35 programs were identified. Ten QA program representatives participated in an interview to share insights on program structure, implementation, and communication strategies. While program goals were similar, the auditing approaches (e.g., second party vs. third party), program structures (e.g., voluntary vs. mandatory) and data collection methods (e.g., self-reported vs. on-farm evaluation) varied. Most (80%) programs were either voluntary or required for market access, with few being mandated by government. Most (57%) programs required some form of on-farm evaluation. Producer buy-in to program participation was noted as a challenge. Lessons learned from developing animal care programs highlighted that clear and direct communication with stakeholders is key. Educating stakeholders on program goals, structure, and purpose was a foundational step in building interest and support. Animal welfare topics of future focus for existing QA programs included pain management, surplus calf management, antibiotic use, cow-calf separation, and prohibition of permanent tethering. These results highlight the variety of approaches to animal welfare assessment and quality assurance, and demonstrate how science, best practice, and supply chain expectations are influencing global programs and policies.

Towards Co-Produced Policy Frameworks to enhance animal health and welfare in organic, extensive and small-scale pig and poultry farming systems

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This study investigates knowledge, perceptions, and management practices across six countries involving about 100 respondents (i.e. farmers, veterinarians and advisors) from organic, extensive, and small-scale pig and poultry farming systems. Utilizing a comprehensive questionnaire, we assessed the importance of various welfare aspects, familiarity with biosecurity concepts, and the implementation frequency of specific biosecurity measures. Key areas explored include the health status of incoming animals, visitor restrictions, cleanliness protocols, feed storage protection, and the perceived risk of disease outbreaks. Additionally, participants' trust in institutions and perceptions of self-efficacy and self-esteem were recorded. With this study, we will reveal how the participants understand the role of biosecurity as well as their level of trust in current policies and health plans in ensuring animal health and welfare in organic, extensive and small-scale farms and how varied levels of agreement on the effectiveness and applicability of current measures are. Leveraging existing theories on policy co-production, we advocate for a paradigm shift towards more inclusive policy-making processes. This approach emphasizes the importance of giving voice to policy targets—namely, the farmers, veterinarians, and advisors—ensuring their perspectives and practical challenges are integral to crafting responsive, effective health and welfare policies. Our research underscores the potential of co-produced policy frameworks to enhance biosecurity compliance and efficacy, ultimately contributing to improved animal welfare and farm resilience in the face of biosecurity threats. This study sheds light on the current state of biosecurity practices within targeted farming systems. It can be part of decision-making processes for future policy interventions that align more with the realities of organic, extensive, and small-scale farming operations.

Current state of play of application of welfare assessment protocols in commercial practice: a literature review

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Within the framework of the EFSA project "More Welfare: towards new risk assessment methodologies and harmonized animal welfare data in the EU", a literature review was carried out on the current application of welfare assessment protocols in commercial practice. We reviewed scientific literature between 2013 and 2023, and focused on the following farm species: dairy and beef cattle, sheep, goats, pigs, poultry (broilers, laying hens, turkeys, ducks, geese, quail), meat horses, fish (5 species), aquatic invertebrates (4 species), and insects (3 species). Dairy cattle were found to have the highest number of scientific papers (n=79), followed by broiler chickens (n=28) and pigs (n=27), and none were found for insects and invertebrates, clearly indicating a gap for these species. Welfare indicators were extracted from the papers. Most indicators were found for dairy cattle (n=648) followed by beef cattle and veal calves (n=269) and horses (n=218) while least indicators were found for turkeys, ducks, geese and quail (n=61). The results showed that overall, for all species, most of the indicators were found for health domain (46%), followed by environment domain (26%). There were only limited indicators applied for mental state domain (7%) and behavior domains (9%), indicating further development is needed in these domains. The majority of indicators was animal-based, although resource-/management-based indicators were frequently applied in the environment domain. Grouping of indicators showed application of similar indicators across species, such as for human-animal relationship, thermal comfort, and injuries. Besides Welfare Quality being the most frequently applied assessment protocol, also other welfare assessment protocols were applied, especially for dairy cattle and pigs. This indicates a need for standardization of welfare assessment protocols.

Session 5 Theatre 7

Current state of play of animal welfare assessment activities across the EU

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Within the framework of the project "More Welfare: towards new risk assessment methodologies and harmonized animal welfare data in the EU", commissioned by EFSA, desk research was used to map activities related to on-farm animal welfare assessment. Five types of activities were mapped: 1) For research projects (RP), a systematic review was carried out in both national and international research funding databases (2019 onwards); 2) For operational groups (OG) and 3) enforcement activities (Enf), official websites (European national ministries and CAP-related sites) were screened as a narrative review; Finally, 4) labelling schemes (LS) and 5) thematic networks (Net), were reviewed through Google and European Commission-related websites. RP showed knowledge gaps for rabbits and insects (except for honeybees). A lack of data harmonization on assessment protocols and aggregation/scoring systems was found in LS. RP and OG focused on the collection/development of animal-based measures (ABMs), with a clear target on precision livestock farming (PLF) sensor development. A high diversity of assessment protocols was found for LS and Enf, which mainly collected aspects related to welfare hazards (resource and management-based indicators), the mental state domain was hardly addressed and PLF was not used. Clear gaps in LS and Enf were found for horses, fish other than salmonids, and insects.

Session 5 Theatre 8

The Value of Pig Welfare among Other Product Attributes in a Sample of Irish and UK Consumers

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Consumers are becoming more mindful of production characteristics such as animal welfare when purchasing meat products. This study aimed to identify whether there is scope for Irish pig meat domestic and export market diversification through the introduction of pig welfare or sustainability assurance labels. It explored the value Irish (n=387) and UK (n = 379) consumers placed on three pig meat product attributes: assurance labels (none, welfare, sustainably produced), price (standard, 10% and 40% increase) and product type (ham, bacon, pork chops). Using an orthogonal design, nine conceptual product profiles were generated and included in an online survey where consumers were asked to rate each product from 0 ('would definitely not purchase') to 10 ('would definitely purchase'). Using SPSS, conjoint analysis generated importance and utility (value) estimates for the different product attributes. Since there was little difference between consumers utility estimates in the two countries, the utility estimates of the total sample were used to generate three distinct consumer clusters which were labelled 'indifferent' (68%), 'like labels' (23%) and 'pro pig welfare' (9%). These clusters were further profiled using other survey data collected, such as sociodemographic characteristics, food choice motives and latent psychological constructs. Although two thirds of the sample (the 'indifferent' cluster) seemed apathetic towards the assessed product characteristics, the other two clusters did value the pig welfare label as a product attribute, and 'pro pig welfare' consumers had a small positive utility for the price. In addition, the 'like label' group considered other sustainability related characteristics to be important and were less likely to feel welfare products were out of their budget. These findings are suggestive of a market for such products in Ireland.

Session 5 Poster 9

Investigating the welfare impacts of wind turbines and solar panels on grazing livestock

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Animal welfare is a priority in ensuring the sustainability of livestock farms, optimising their productive benefits and promoting food security. Our aim is to analyse the available information on the potential impact of renewable energy installations (mainly wind and photovoltaic and associated high-voltage power lines) on livestock species, so that it can serve as a basis for integrated planning and evaluation of renewable energy structures that directly or indirectly involve grazing livestock. The operation of wind farms can cause social and eating behaviour alterations and physiological stress stress to livestock species through four main disturbances: low frequency noise or infrasound, shadow flicker, extremely low frequency magnetic fields and radio frequency electromagnetic radiation, and power lines can affect habitat use by animals. When installing solar panels, consideration should be given to the possibility of integrating livestock species that make maximum use of the vegetation cover of the ground beneath the infrastructure, and only then can animal welfare be improved by providing shade that reduces heat stress and increases forage quality and grazing time. Assessing the impact of these structures is considered a complex area of research, with only partial (wind turbines) or virtually no (solar farms) answers to date, and even less for livestock than for wildlife. Future research should aim to improve knowledge of habitat conservation issues and identify mitigation measures to overcome negative impacts on livestock, which also act as sentinels for environmental and public health.

Session 5 Poster 10

The legitimacy of industry-led dairy cattle welfare governance: A case study comparison of the United States and Canada

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The organizations responsible for animal welfare governance can impact the structure, priorities, and enforcement of animal welfare standards and policies. In some jurisdictions, farm animal welfare governance is largely in the hands of private organizations. For example, dairy cattle welfare governance in the United States (under the Farmers Assuring Responsible Management [FARM] Program) and Canada (under the Code of Practice for the Care and Handling of Dairy Cattle and proAction [Code-proAction]) is led by private dairy industry actors who create animal welfare standards and audit farms for compliance. Their welfare standards fill the role that might otherwise be filled by legislation, and nearly all dairy farms in their respective countries are subject to their standards. The primary aim of this study was to assess the legitimacy of these industry-led systems according to an input, throughput, and output framework for normative legitimacy using publicly available information from the websites of the FARM and Code-proAction programs. The secondary aim was to review the literature relating to the empirical, or perceived, legitimacy of these organizations. We found that the normative legitimacy of both programs was enhanced by their commitment to science and broad participation by dairy farms across their respective countries. However, both programs face limited normative legitimacy due to prioritizing industry representation, having limited transparency about the outcomes of farm audits, and having slow update and audit cycles for their standards, potentially limiting the extent to which they reflect current animal welfare science and thus limiting their ability to ensure a high level of welfare. The empirical legitimacy of these programs was mixed among dairy producers in both countries, and the industry-led nature of these organizations and their associated standards likely limits perceived legitimacy among members of the public. We suggest that enhancing representation of different stakeholder interests and increasing transparency will increase both the normative and empirical legitimacy of these programs, and may contribute to their long-term social sustainability.

Session 5 Poster 11

How to take welfare into account in a multi-criteria assessment of new breeding practices or systems

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While society's demand for welfare is an essential factor in the choices made by farmers to develop their farms and practices, it is hampered by a lack of knowledge about the possible deterioration in other aspects of livestock performance. A multi-criteria evaluation tool, Multiporc, is being developed to address this issue for pig producers in France. It focuses on five dimensions: economic, environmental, health, labour and animal welfare, evaluated for ten levers for improving the welfare of pigs on the farm: stopping or reducing the duration of sow restraint, type of floor and surface area per animal, openness of buildings, stopping tail docking on a variable proportion of the animals on the farm…. For most of the levers, we do not have references for an overall assessment of animal welfare. We have therefore developed an approach based on expert opinion by bringing together 13 researchers, zootechnicians, vets and technicians specialising in the field of welfare. They come from agricultural research and/or development (INRAE, Institut Agro, Chambers of Agriculture, IFIP), producers groups (Terrena, Cooperl, Eureden, Parc Armor Evolution) or quality audit departments (Kermené). Initially, for each of the levers, we identified which aspects of welfare were concerned and to what extent they could be affected, based on the list of indicators proposed in the EFSA report on pig welfare (2022). We thus identified a list of indicators for each lever, grouped according to the four principles set out in Welfare Quality® and BEEP (French welfare assessment tool for growers and finishers) : proper feeding and watering, quality of housing, good health, appropriate behaviour. Secondly, we asked participants to rate the impact of each lever on the selected indicators by means of a survey questionnaire, indicating whether the lever improved or worsened welfare for that indicator (respectively with scores of + to +++ or — to -) or whether it had no effect. The results were analysed and discussed in a plenary session to reach a consensus, with comments where appropriate. All the information will be integrated into a web tool that will make it easy to visualise the benefits or points of vigilance around the implementation of the levers considered.

Session 5 Poster 12

Improving animal welfare as a catalyst for just transition towards equitable, humane and sustainable food systems

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This study delves into how policy, science, and business influence animal welfare within a just transition to meet the Sustainable Development Goal staying within the 1.5°C limit. Just Transition is a shift towards alternative protein and more generally, an equitable, humane, and sustainable food system (EHS). Using the UK, Thailand, and Kenya as business cases, we explore the role of animal welfare within an EHS. The oversight of animal welfare to address the intertwined challenges of food security and climate change reflects a deficiency in systemic thinking. Despite the significant economic and nutritional contributions of livestock, sustainability assessments sideline livestock welfare. World Animal Protection, as part of a coalition of organisations dedicated to ensuring a just transition, created a vision and pathways for a EHS. We adapted a data collection tool to systematically gather farm data, aiding in the identification of high welfare standards that included: firstly, the existing Agroecology assessment by Biovision aligning with the 13 principles drafted by FAO; secondly, the Good Life assessment that is segmented into five categories, each representing one of the animal welfare domainsl lastly, the farm Economic assessment evaluating capital, waste, and opportunity costs. The UK serves as an example of high animal protein consumption country and animal welfare pioneer policy interventions. We tested the tool on two farms, a beef and a mix-system one. Thailand, although also a high animal protein consumption country, faces distinct challenges and opportunities in reconciling animal welfare with economic development. We collected data from a broiler farm. In contrast, Kenya exemplifies the complexities of integrating animal welfare within a developing economy low in animal protein consumption. Here, we collected data from native chickens, layers, and goat farms. In conclusion, the business cases showcase how animal welfare lies at the nexus of policy, science, and business, with Just Transition serving as a catalyst for change. By embracing a systematic understanding of animal welfare within a EHS, we aim to support a just transition.

Session 5 Poster 13

Improving welfare by sharing knowledge: the functioning of an EU Reference Centre for Animal Welfare

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Competent authorities may face difficulties in implementing EU legislation on animal welfare. The EU Reference Centre for Animal Welfare – Ruminants & Equines, established by the Official Controls Regulation, aims to improve the enforcement of animal welfare legislation. The Centre disseminates knowledge and tools to assist EU member states in carrying out official controls regarding ruminant and equine welfare, and more generally to improve animal welfare. First, priority topics are defined from surveys and discussions with competent authorities, EU national reference centres, and the EU Commission. Testimonies of inspectors about the challenges they face in implementing animal welfare regulations are also considered. Then the Centre reviews the scientific and technical knowledge available on these priority topics, describes good practices, and identifies gaps in knowledge that prevent sustainable solutions to welfare issues. New empirical studies can be designed to fill in the gaps in knowledge previously identified. The reviews are largely science-based and provide the foundation for fact sheets, which describe areas for verification of compliance (indicator fact sheets) or provide help to identify room for improvement (thematic fact sheets). Networking events, namely the community of practice and annual workshops enable further discussion of the priority topics to engage in collective learning with competent authorities. Training toolkits are then created for official inspectors. To date, the Centre has published outputs on environmental enrichment, housing and feeding of calves. Topics currently addressed are quality of care, thermal comfort, fitness for transport, and pain management for ruminants and equines, and confinement and work in equines. All publications are available on www.eurcaw-ruminants-equines.eu.

Session 5 Poster 14

Evaluating Animal Welfare at Farm Level: Innovations and Applications in the Minerva Foods Welfare Assessment Program

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The welfare of animals in agricultural systems is a critical aspect of sustainable and ethical food production. Minerva Foods, the second-largest beef company in Brazil and Uruguay and the largest beef exporter in Paraguay, Colombia, and Argentina, has developed a comprehensive program since 2021 for assessing animal welfare at the farm level. This program aims to ensure that animals are raised, handled, and processed in a manner that meets high welfare standards. The evaluation process utilizes a set of carefully designed forms and questionnaires to collect data on various welfare indicators across different species and production systems. The methods employed in the Minerva Foods Welfare Assessment Program are based on scientific principles and best practices in animal welfare science. The program covers a wide range of species, including bovines, swines, poultry, sheep, dairy cattle, laying hens and fish. The assessment is based on annual questionnaires targeted at each species, which must be filled out by farmers and slaughter facilities. These questionnaires include parameters such as health status, mortality, behavior, environment, welfare practices, antibiotic usage, transport conditions, and other management practices, providing a holistic view of the animals' welfare. The findings from the welfare assessments are used to inform management decisions, provide feedback to respondents to promote better practices, and privilege producers with higher standards. Recently, we started a collaboration with the Center for Welfare Metrics so that the improvements obtained with our programs can also be expressed quantitatively with the Welfare Footprint metric. We hope the program serves as a model for other companies and stakeholders in the agricultural sector, promoting the adoption of welfare-friendly practices and contributing to the advancement of farm animal welfare science.

Session 5 Poster 15

Assessing the Environmental Impact of Animal Welfare Policy Changes on UK National Egg Production

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Animal welfare policy changes can affect farm practices and productivity, and consequently change the environmental impact of production. In this study, we assessed the effects of animal welfare policy changes on the UK egg production system. Approximately 44% of laying hens in the UK are kept in cages, despite a growing movement advocating for banning cages. Additionally, consumers of commodities are increasingly concerned about animal welfare, leading retailers to adjust by offering more free-range products, as they perceive the free-range system as better for animal welfare compared to the cage system. Consequently, farmers are shifting production to systems without cages. However, there is a lack of literature addressing the environmental impacts of these policy changes. In our study, we estimated the total environmental impacts of egg production in the UK, taking into account the current proportion of various systems, such as cage, barn, non-organic, and organic free-range systems, utilizing data gathered from previously published studies. We compared these results with four different scenarios that have same total production but different distributions into systems: one including barn, non-organic free-range, and organic free-range systems; another with a completely barn-based system; a third with a completely free-range system; and finally, a scenario with a completely organic free-range system. The results show that the current proportion of production systems has the lowest Global Warming Potential (GWP) over 100 years (IPCC 2021), while all other alternative systems exhibit higher GWP 100 values. Our findings indicate that for a comprehensive view, future animal welfare policy changes should also consider the environmental impact of production – especially when there are tradeoffs.

Session 5 Poster 16

Farm animal welfare during climate crises: a OneWelfare perspective

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The occurrence of natural disasters, such as wild fires, floods, droughts, earthquakes and tornadoes, are predicted to become more frequent, more intense and in shorter succession. The effects are global and affect livestock as well. There is disproportionate little news or scientific coverage about the impact of such disasters on animal welfare. This may be due to their sporadic and somewhat unpredictable occurrence, as well as the difficulties with obtaining valid data, such as the number of animals lost or injured. The objective of this review is to investigate, and raise awareness of, the impact of climate emergencies on animal welfare and its interconnectedness with human well-being and the environment. A second objective is to raise awareness of the shortcomings regarding evacuation plans and policies for farm animals during emergencies. OneWelfare offers a holistic perspective to address the interconnectedness between animal welfare, human well-being and environmental conservation. During natural disasters, large numbers of animals are affected (e.g., killed, injured, displaced or scared). The decision on what happens to them may depend on a few persons only, mostly the farmer. Taking the decision to evacuate, euthanize, release the animals or to leave them to die (to save one's own life) is a considerable mental burden. Farmers have one of the highest suicide rates across professions, and given the relationship between human mental health and animal care, more support is needed to prepare farmers for the multitude of effects of climate change. Moreover, released or escaped animals may become feral and threaten the local habitat. Policies need to be developed on what to do with farm animals before, during and after evacuations, in order to safeguard their welfare, as well as to ease the burden on farmers and the local environment. With the clear increase in natural disasters, there is an urgent need for more information on animals' fate during and after these life-threatening circumstances. Hereby cross-agency collaboration (e.g. between first aiders and veterinarians) is essential, while technology (such as animal tracking) may assist in providing information from situations beyond human capacity.

Session 6 Theatre 1

Plenary 6. Learning and cognition in farm animals and its application to animal husbandry and management

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Learning and cognition in farm animals and its application to animal husbandry and management In the field of animal learning and cognition, there are a number of species that have been the subject of research for years and are thought to have special cognitive skills. These include non-human primates, dolphins and, more recently, several members of the Corvus family. In recent decades, the cognitive abilities of domestic animals, particularly dogs, have also been the subject of research into the effects of domestication on learning and cognition. Finally, the cognitive abilities of domesticated species that are not pets – the various species of livestock – have also been of increasing interest. Knowledge of how they perceive their environment has an important influence on our attitudes towards them and is the basis for the design of appropriate husbandry conditions. The inclusion of a wider range of domesticated species is crucial for a more comprehensive understanding of the effects of domestication on learning and cognition. When considering animal cognition, we must distinguish between operant conditioning on the one hand and reasoning on the other, a distinction that is often difficult to make. Operant conditioning begins with heuristic trial-and-error learning, in which the rewarded behaviour becomes the rule after repeated temporal contiguity. Whereas operant conditioning is about making an association between two observable facts, reasoning requires the ability to identify the causes of a partially ambiguous fact and to make sense of the observed phenomenon. In my presentation, I will present some of the research approaches that we have used to study both of these issues in goats. Finally, I will present two examples of how knowledge of learning and cognition can be translated into practical housing and management solutions aimed at improving animal welfare, reducing the negative environmental impacts of husbandry and improving animal quality of life.

Session 6 Theatre 2

Being bored? Validating the valence of stimuli as a basis to assess boredom-like states in pigs

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Boredom is a potentially prevalent animal welfare concern given the barren and monotonous housing conditions of many captive animals. To be able to study boredom and its welfare consequences, we need to be sure that animals actually experience boredom and no other negatively-valenced states, e.g. depression or apathy. To differentiate between these different states, it has been suggested to analyse the behaviour of animals confronted with stimuli of different valence (positive, ambiguous, negative). Depressed animals are hypothesised to be less interested in positive stimuli, due to anhedonia, a core symptom of depression, whereas apathetic animals are thought to show a decreased interest in stimuli of all valences. In contrast, bored animals are hypothesised to show an increased interest in all types of stimuli, including ambiguous and negative ones. To ensure that the stimuli are indeed assessed as positive, ambiguous or negative by the animals, we aimed to validate the valence of a variety of stimuli in domestic pigs, a species commonly kept in barren and monotonous conditions. To this end, 39 pigs (19 gilts, 20 weaned piglets) were individually exposed to twelve stimuli pre-categorised as positive (e.g. peat, silage), ambiguous (e.g. wooden rectangle, playback of farm noises) or negative (e.g. fan, noise of cans in a shaken bag) in an approach-avoidance paradigm. The effects of stimulus, age (gilt, piglet) and their interaction on numerous approach parameters (e.g. stimulus approach, orientation, contact) and avoidance parameters (e.g. turning away from stimulus, time spent in avoidance room) were analysed. Stimulus significantly affected all parameters (all p-values < 0.001) and the observed pattern was in accordance with the pre-categorisation for many but not all stimuli, leading to a re-categorisation of the valence of five stimuli. The significant interaction between stimulus and age for some parameters (five out of eleven parameters: $p < 0.004$) shows that age differences need to be considered. Our study forms the basis for the selection of stimuli and parameters of future tasks aiming to differentiate between the animal-welfare relevant states boredom, depression and apathy in pigs.

Impact of the early life environmental conditions and motivation on cognitive abilities in pigs

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Farm animals' cognitive development is relevant for their welfare, as it influences their ability to adapt to farm circumstances. Previous studies show contradictory results about how the environment influences cognition, which may be due to animals' motivation to perform tests. Our aim was to assess the effect of early life environmental conditions on cognitive abilities in pigs, while considering motivation to go to the test arena. A spatial holeboard task was conducted with 92 pigs (52M; 40F) to determine spatial memory. Pigs were housed in an enriched (E; with straw and toys) or a barren environment (B; without straw). The holeboard had 16 locations in a 4×4 matrix with 4 of them baited. Tests were carried out until pigs had a reference memory score of at least 0.7 on 3 consecutive tests (n visits to bait/n visits to any location; range 0 to 1). Motivation to voluntary go to the test was scored with a scale for leaving the pen (0-3) and locomotion (0-4), and by duration to go from the pen to the test arena. The scores were summed into one motivation score, with a low score indicating a high motivation to go to the test voluntarily. The results showed that barren housed pigs had a better reference memory than enriched housed pigs (B: 0.53±0.011, E: 0.49±0.011; p=0.02) and visited fewer locations (B: 5.3±0.21, E:6.0±0.20; p=0.02). They did not differ in test duration (avg. 93 s) or working memory. Less motivated pigs were slower in performing the test (38 s slower per point difference; p<0.001), visited fewer holes (b= -0.81±0.244; p=0.001) and had a slightly lower working memory score (b= -0.05±0.017; p=0.002). However, barren and enriched housed pigs did not differ in motivation score (p=0.73). Heavier pigs were slower in the test (p=0.01) and visited fewer holes (p=0.04). In conclusion, barren housed pigs showed a slightly better spatial cognition than enriched housed pigs. Motivation influenced most of the test outcomes, but did not differ between pigs from different housing conditions. This shows that the difference in cognition is due to the environmental treatment independent of motivation.

Development of an Acclimation Protocol for Conditioned Place Aversion Testing in Neonatal Goat Kids

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Conditioned Place Aversion (CPA) is a valuable behavioral assay to investigate an animal's response to aversive stimuli, such as painful husbandry procedures performed in farm animals. This methodology has not yet been applied to neonatal goat kids. Because previous studies showed that a number of factors can affect animals' preference for different environments and thus bias results, our objectives were to assess whether side (left or right), color (red or blue), and social isolation (alone vs in pair) affected kids' preference for one or the other pen. This study was conducted over two days at a commercial dairy goat farm in October 2023. We randomly enrolled 16 healthy Alpine and Saanen goat kids (mean age 14 ± 5.1d,range: 4 – 19d) over two days, allocating them to pairs (n=4 pairs; 8 kids) or individual testing (n=8 kids) for a 15-minute test in a customized pen, with color cues switched on the second day (e.g., red panels moved from right to left or vice versa). Vocalizations (as a proxy for stress response) were recorded by direct observation during pen testing. Time spent in each color and on each side was recorded via video, evaluated by a trained observer. Vocalization frequency and time spent in each color and side were analyzed using linear mixed models accounting for the random effect of kid. Kids vocalized more when tested as individuals as compared to pairs (327 vs. 19 ± 20; P < 0.001). Overall, kids had a preference for blue (blue vs. red; 298 vs. 226 ± 23s; P = 0.006) and the left side (left vs. right; 304 vs. 220 ± 23s; P = 0.003). Both differences were driven by individually tested kids. The findings suggest challenges in assessing behavioral responses of solo kids, suggesting that individual preferences could skew test outcomes. Given that both color and side biases may jeopardize the detection of treatment effects, future work will explore alternative colors and pen orientations or the possibility to assign treatment effects according to individual preferences.

Laying hens prefer synbiotic-enriched water even during stress

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Synbiotics (S) (pre- and probiotics) are promoted as an antibiotic alternative for potential positive effects on poultry health and behaviour, particularly during stress. While S can be administered in drinking water, it remains uncertain if birds can discern between S-enriched water (SW) and pure water (W), and if they exhibit preference changes. Our objective was to test if laying hens prefer SW and if consumption of S is associated with feather pecking (FP) and damage (FD). White Leghorn chickens (N=226, 37 woa) were housed in 12 enriched floor pens. Two colour-coded jugs were presented simultaneously, one providing SW (commercial S; 80mg/L W; probiotics (Lactobacillus, Bifidobacterium), prebiotic fructo-oligosaccharides), and the other providing W. Hens were habituated to both liquid types for two weeks. Baseline liquid intake (pre-stress) was measured for one week. Birds were introduced to chronic, unpredictable social stress for three weeks, followed by a two-week post-stress period. FD was recorded per period and FP was observed in video recordings. A generalized linear mixed model evaluated liquid intake with fixed effects of water type (SW/W), period (pre-stress/stress/post-stress) and their interaction. Hens consumed significantly more SW (78.5 ml/bird/day) than W (68.4 ml/bird/day) across all periods ($p<0.0001$), and during each individual period (pre-stress: $p=0.0003$, stress: $p=0.0179$, post-stress: $p=0.0266$). A generalized linear mixed model (multinomial distribution) evaluated the odds of lower FD. Hens had better feather cover in prestress (OR=2.0, 95% CI: 1.39-2.79) and stress (OR=1.8, 95% CI: 1.25-2.50) than post-stress. No significant difference in FD existed in pre-stress compared to stress (OR=1.11, 95% CI: 0.79-1.57). Hens did not exhibit an increase in FP ($p=0.6240$) even during stress. Given birds' preference for S, future research should explore additional potential health benefits of S for poultry welfare.

Cognition and aggression at the group level: insights from social network analysis

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Social network analysis (SNA) is a recent advancement in the study of aggression in pigs and its effects on welfare. The distribution of aggression may reflect variation in the cognitive ability of group members, such as the ability to assess opponents and to remember the outcomes of aggression. We tested whether performance in cognitive tests predicts aggression network structure. Pigs were housed from weaning to regrouping at 14 weeks in groups of four littermates (two males; two females). To estimate cognitive ability, 175 pigs were tested in a spatial discrimination task and reversal learning test and ranked by their performance in each test. At regrouping, the two pigs with the overall highest ranks from each litter group were allocated to a "high" test performance pen and the two lowest ranks were allocated to a "low" test performance pen (median 14 pigs/ new pen). Four network types were made: ALL (all aggression), UNI (unilateral aggression), FIGHT (escalated fighting) and WIN (fight outcomes). Mixed models estimated the association between test performance and edge density, centralisation (degree, betweenness and eigenvector) and largest clique size. There was no difference in SNA measures between "high" and "low" test performance pens. However, in pens where more pigs achieved reversal learning, aggression networks were less centralised, by the following measures: weighted in-degree (ALL, UNI) and all-degree (FIGHT). Lower centralisation of aggression, particularly 'in-degree centralisation', means that pigs received a more equal distribution of aggression. In pens composed of pigs with greater reversal learning ability the risk that a minority of pigs experience a disproportionate amount of aggression is reduced. These results show that facilitating the development of cognitive ability in pigs, for example by providing a complex physical environment, may have positive effects on the welfare costs of regrouping.

The influence of two different feeding intensities on the emotional state of dairy cows

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The aim of the present study was to compare a high- (HI) and a low-input (LI) organic milk production system with regard to their effects on the emotional state of dairy cows. We hypothesize that HI feeding, compared to LI feeding, has a positive short-term effect on the emotional state of dairy cows due to increased energy and nutrition supply. Cows (German Holstein) were either fed to achieve an annual milk yield of 9000 kg (HI, n = 6) or 7200 kg (LI, n = 7). To investigate the effects of feeding intensity on the cows' emotional state, we conducted Judgement Bias Tasks (JBTs) which assess an individual's emotional state based on its behavioural response to ambiguous stimuli. Cows were trained to discriminate (Go/NoGo response) between a positive location (containing a feed reward) and a negative location (delivering an air puff), presented in a pseudo-randomized order over eight sessions of seven trials each. After the training phase, cows were tested twice on two consecutive days. Testing sessions always started with a positive trial, followed by a negative trial and ended with a negative trial, followed by a positive trial. Ambiguous locations (Ap = closer to positive location, An = closer to negative location, A = equidistant from positive and negative locations) were presented to the cows in the order Ap/An/A during the first testing session, and A/Ap/An during the second testing session on trials 3, 4, and 5. Statistical analysis, employing Wilcoxon Signed Rank test, showed that there was no treatment difference in the cows' latencies to approach the ambiguous locations (Ap: HI: 59.1 ± 11.23 s, LI: 65.9 ± 10.56 s, P = 0.90; A: HI: 79.7 ± 7.02 s, LI: 67.2 ± 10.02 s, P = 0.35; An: HI: 79.2 ± 7.31 s, LI: 90.0 ± 0.00 s, P = 0.13) or in the percentage of Go responses (Ap: HI: 42.6 ± 14.87 %, LI: 28.6 ± 12.53 %, P = 0.51; A: HI: 16.7 ± 11.24 %, LI: 28.6 ± 12.53 %, P = 0.50; An: HI: 16.7 ± 11.24 %, LI: 0.0 ± 0.00 %, P = 0.13). These preliminary results suggest that the emotional state of cows is not affected by the feeding intensity, however it is worth discussing that none of the LI cows approached the An location.

Effects of social interactions on the emotional state of the horse

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The ability to establish relationships with congeners is a prerequisite for the welfare of social species. However, some of them, such as the domestic horse (Equus caballus), are kept in social isolation, which is a stressful situation for the animal. The negative consequences of individual housing on the welfare and health of equids are now widely known and may also have effects on emotions and cognition. The aim of this study was to assess the impact of socialisation on the emotional state of 20 horses housed in individual stalls. The population was separated into two conditions: horses with no opportunity for social interaction (isolated condition) and horses with the opportunity to interact with a conspecific temporarily (social condition). The latter met in pairs for 1 h/day in a device allowing social interactions during 4 months. After this period, all the horses passed a judgment bias test (JBT). The assumption of this test is that the living conditions of an animal can change the way it perceives its environment and lead to a judgement bias. The JBT estimates whether the horse perceives the information in its environment as positive, i.e in an optimistic way, or negative, i.e. in a pessimistic way. In term of methods, the subject is first trained to learn a positive and a negative position for a bucket. Then the bucket is placed in ambiguous positions, between the positive and the negative position without prior learning. The approach (GO response) and the latency to reach the bucket are recorded. Horses in the social condition approached the near negative ambiguous position more often (GLMM: $\beta \pm SE = 2.0 \pm 0.9$, $z=2.22$ $p=0.03$) and faster than horses in the isolated condition (Cox model: HR= 1.37, 95% CI = (0.1;2.64), p=0.04). These results suggest a more positive perception of the environment for horses that were allowed to have social interactions compared to those housed in social isolation. Therefore, it appears that maintaining daily social contacts has a positive effect on the affective state and improves the overall welfare of the horses.

Session 6 Poster 9

Protocol development for alpaca welfare assessment: cognitive paradigms in a new "One welfare" perspective

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Effective application of the Five Domain Model in a One Welfare perspective to develop a welfare assessment protocol suitable for alpacas, should consider nutrition, environment, health, behaviour and mental state, but also the human-alpaca relationship, its social and anthropological impact as well as the influence on environments very different from those where alpacas have evolved. Study designs for welfare assessment protocols need to be based on solid scientific knowledge about the behaviour and cognition of the species involved. Nowadays scientific literature lacks these data for some domestic species such as alpacas, whose diffusion for both production and recreational purposes has increased more and more out of the Andean area. Cognitive tests can be extremely useful to support the development of a welfare assessment protocol. However, the paradigms should be set up with accurate experimental design to collect reliable data, despite the farm environment, reducing bias as much as possible. The test battery we employed includes a) food preferences for a correct choice on positive reinforcement; b) the novel object test to assess response to novelty; c) expression of social behaviour and social network analysis; d) detour-task test and e) reversal learning test to understand problem solving attitude and sensitivity to positive or negative outcomes. We included in the study 14 animals (7 males and 7 females). Afterwards, this information will be used to investigate further cognitive areas to provide preliminary data (e.g. affiliative behaviour, anticipatory behaviour, violation of expectation etc.) valuable for the definition of a welfare assessment protocol.

Session 7 Theatre 1

Teat- and body condition of foster cows on a dairy farm

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There is growing interest among farmers to replace the early separation of dairy calves from their dams by rearing of the calves in a cow-calf contact (CCC) system for several weeks to months. One type of a CCC system that can be found in practice, is the use of foster cows (FC) that nurse two to four calves and are normally not milked. However, some farmers report teat damage in their FC. The body condition of the FC may also be affected if their milk yield and the number of suckling calves do not match. Therefore, teat condition (TC) and body condition score (BCS) were compared between 21 FC nursing their own and two other calves and 21 milked cows (MC). All cows were part of a Holstein Friesian herd with a mean lactational milk yield of 8,861 kg. The FC were housed in two groups of 12 cows with the calves in a deep litter area. The milking herd was housed in a cubicle barn on the same organic farm and were milked twice daily in a carousel. Starting in the 2nd to 4th week of lactation, TC and BCS were assessed once per month at four time points. Teat colour, lesions and dry skin were scored on a 2-point scale: 0= no changes vs. 1= mild or severe changes. BCS was assessed on a scale from <2 to 4.75 with 0.25 increments (inter-rater-reliability TC: PABAK>0.90, BCS: r=0.96; n=34). The percentage of cows with TC score 1 for teat colour and dry skin did not differ between FC and MC (median for all: 0%, p>0.1, n=21, Mann-Whitney U test). More FC than MC had teat lesions, often at month 2 or 3 (FC: 25%, 3 times in total: severe changes, vs. MC: 0%, p=0.004 n=21, Mann-Whitney U test). The minimum BCS over the four assessments was higher in FC than in MC (median=3.50 vs. 3.25, p=0.007). The BCS range did not differ between treatments (median=0.25, min=0.00, maxFC=0.75, maxMC=1.00, p>0.1). However, during the four months, 7 times MC were too lean (<2.50) and more FC were overconditioned (>3.50: 45 vs. 16). The BCS of some FC indicates that they could nurse a further calf, but this could increase the incidence of teat lesions. Teat lesions in FC may induce pain during nursing, which is a welfare problem. Lesions most often were mild and healed by the fourth assessment. It can be recommended to adjust the feeding and teat care of the FC.

Evaluation of oral firocoxib, administered to the sow and delivered transmammary to nursing piglets, to manage pain associated with surgical castration and tail docking

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Piglets raised on commercial production facilities in the United States undergo surgical castration and tail docking without the provision of an analgesic or anesthetic drug to manage pain. Firocoxib can be transferred transmammary from the sow to her nursing piglets and has demonstrated efficacy in reducing pain biomarkers in pigs. The aim of this study was to determine which dose of transmammary-delivered firocoxib was most effective at alleviating surgical castration and tail docking pain in piglets. Sows (n=40) were randomly assigned to one of four treatment groups of oral firocoxib at the following doses: 3.0mg/kg (FIRO3), 4.0mg/kg (FIRO4), 5.0mg/kg (FIRO5), 6.0mg/kg (FIRO6), or oral placebo (CON; n=8 sows/treatment group). Piglets (n=400, 10 piglets/litter) were randomly allocated to one of two procedures: processed (n=8) or sham (n=2). Piglet vocalizations were recorded at the time of processing. The following outcomes were also collected in piglets, out to 48h post-processing: blood cortisol, blood-drug concentration, behaviour, pressure mat gait analysis, infrared thermography, and facial grimace assessment. Processed piglets elicited calls of greater energy and amplitude compared to sham-handled piglets ($p<0.05$). Irrespective of treatment, processed piglets applied more force and pressure on their front limbs and had higher cortisol concentrations compared to sham-handled piglets ($p<0.05$). Male piglets exhibited more pain-related behaviours than female piglets across the observation period ($p=0.003$). FIRO3 and FIRO5 piglets displayed less pain-related behaviours than the CON group ($p=0.03$). FIRO3 piglets also had lower cortisol concentrations than piglets in the FIRO5 group ($p=0.02$). Preliminary results from this study suggest that 3.0mg/kg oral firocoxib administered to the sow and delivered transmammary to her nursing piglets, may be effective at reducing stress and pain associated with processing procedures. Further outcome analysis will be used to confirm these initial findings.

Novel administration of meloxicam to surgically castrated bull calves via medicated lick blocks

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Livestock husbandry procedures such as surgical castration inflict long-term pain and inflammation, highlighting the animal welfare and production concerns. Pain relief products available to producers including topical anaesthetics (TA) and non-steroidal anti-inflammatory drugs (NSAIDs) are limited to peri or post-operative administration, failing to address procedural pain, and lasting only 24-72 hours. Fourty 6 month old Bos taurus calves were randomly allocated to treatment groups: meloxicam lick block (ML), subcutaneous meloxicam (M), no meloxicam (NC), or sham castration (PC). ML calves had 19 hours of access to the medicated lick blocks prior to castration. M calves were administered 0.5mg/kg of meloxicam subcutaneously immediately prior to castration. Blood samples were collected from ML and M calves via jugular venepuncture for plasma meloxicam concentration (PMC) analysis. Weight, scrotal temperature and diameter, wound healing, and behaviour were measured over 14 days. The meloxicam delivered via the lick block reduced weight loss and increased locomotion and eating. On all days except the first, PMC was greatest in ML calves ($P<0.001$). The loss of weight was minimised in ML calves compared to M and NC calves ($P=0.044$). Eating increased in ML calves immediately after castration and was reduced when the medicated block was removed ($P<0.001$). Locomotion was greatest in ML calves ($P=0.018$). There was a trend for scrotal diameter to be less in ML calves compared to M ($P=0.069$). The administration of meloxicam via medicated lick blocks enabled pre-emptive and long-term analgesia. This project highlights potential for feed-based delivery of analgesia.

Supporting breeders to better manage animal pain: the case of sheep tail docking

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Pain management during preventive interventions on sheep farms will be increasingly regulated in Europe. The aim of this study was to assess the pain generated by docking practices used on sheep in France, and the effectiveness of an analgesic protocol (0.5-1 ml Procamidor 20mg/ml subcutaneous injection around the tail + 1 mg/kg Metacam 5 mg/ml intramuscular injection) that could be implemented by farmers. Behavioral, physiological and zootechnical indicators were studied 1) in March 2022 on 48 2-day-old lambs (16 control lambs (T), 32 lambs with rubber ring docking without analgesia (16 E) and with analgesia (16 EA)) and 2) in March 2023, on 80 13-day-old lambs (16 control lambs (T), 32 lambs with rubber ring docking : without analgesia (16 E) and with analgesia (16 EA) 32 lambs with hemostatic clamp: without analgesia (16 H) and with analgesia (16 HA)). An analysis of variance (ANOVA) test was used to compare the results of lambs of both ages having undergone rubber ring docking and the two docking methods in 13-day-old lambs. Rubber-ring docking at 2 days of age elicited very few pain-related behaviors. The 13-day caudectomy methods (rubber ring and forceps) induced acute pain in the lambs (elevated serum cortisol levels of 127 ± 58 nmol/L for E and 132 ± 104 for H, 30 min after caudectomy), but with different behavioral characteristics: increase in the number of events for rubber ring caudectomy (255 ± 68 for E and 208 ± 62 for EA vs. 29 ± 7 for T), and appearance of tremors associated with stooped posture for caudectomy with hemostatic clamp (30% of time spent in this position over 2 hours after caudectomy for H and 19% for HA vs. 0% for T). This method resulted in hyperalgesia in most lambs (assessed by Von Frey filaments), persisting for at least 6 days (on average 20% of sensitive lambs for E and EA and 62% for H and 73% for HA). The analgesic protocol tested showed a visible effect only in 2-day-old lambs (the average number of pain-related events was significantly lower in EA than in E during the hour following docking). Further work is needed to find an effective analgesic protocol that can be applied by farmers. Project funded by Interbev

Does familiarity with pen mates affect tail biting in the first week post-weaning in non-docked pigs?

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Tail biting (TB) is an abnormal behaviour observed in intensive pig production worldwide, that has serious animal welfare and economic implications. TB may be increased by stressors that occur at weaning, including separation from the sow, change in environment and diet, and mixing with unfamiliar pigs. Evidence suggests that the proportion of litter mates grouped together post-weaning affects the development of TB behaviour. We hypothesised that increased familiarity between pen mates would be associated with reduced tail injury in the first week post-weaning. Weaning occurred at 4 weeks of age, with 30 litters of non-docked pigs weaned into 24 pens of 12 pigs based on sex and size, with ¾ slatted flooring. Tail damage was assessed by a trained observer 1 d, 4 d and 6 d after weaning (TBS1, 2 and 3, respectively), using the German Pig Scoring Key. A 'familiarity' score (FS) was assigned to each pig, based on the number of known pigs they were grouped with post-weaning. A familiarity score (FS) and tail biting scores (TBS) were then calculated for each weaning pen by averaging over the 12 pigs in the pen. Analyses were conducted using bilinear regressions to relate log(TBS + 0.1) on post-weaning (i) TBS1, (ii) TBS2, and (iii) TBS3 to log(average pre-weaning TBS of animals in a weaning pen + 0.1) and pen average familiarity score. TB was observed in all 24 pens in the week post-weaning, with 12%, 23% and 22% of pigs having a tail injury at TBS 1, 2 and 3, respectively. No relationship was found between average TBS on each post-weaning day and average FS ($p>0.05$). These findings suggest that familiarity with pen mates was not related to tail injury in the week post-weaning. In this study standard commercial weaning practices were imposed, with pigs grouped according to sex and size, resulting in FS being no more than 1.33, which corresponds to only 12% of pen mates originating from the same litter. Further research examining the response to a greater degree of familiarity between pen mates during rearing of non-docked pigs is warranted.

Effects of commercially available toys for piglets with intact teeth on sow teat damage

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Routine teeth clipping is still being performed in newborn piglets by some producers to decrease sow teat damage but done incorrectly, this can cause damage and pain to the piglet. One promising alternative to teeth clipping is providing piglets with environmental enrichments (EE). However, EE such as straw is not compatible with slatted housing systems, can be labor intensive to manage and, has biosecurity considerations. In the present study, we investigated effects of commercially available toys suitable for piglets housed in slatted floor housing systems on sow teat damage. Twenty-two sows were enrolled in the study carried out at the Iowa State Swine Teaching Farm. Shortly before farrowing, three commercially available piglet toys (Easy Fix toy, Rubber ball, Biting Ring) and a jute bag were installed in 12 farrowing stalls. Ten farrowing stalls were not equipped with any EE. Piglet teeth were left intact to assess EE effects as an alternative to teeth clipping. All sows were inspected for teat damage by the same researcher before farrowing as well as at the end of the study, before piglets were weaned at 21 days of age. The following teat conditions were recorded: infection, scab, bleeding wound, split, and missing teat tip. A new variable called "teat issues" was created by summing a number of all teat conditions recorded. Teat issues before parturition and at the end of the study were calculated. A subtraction of teat issues before parturition minus teat issues at the end of the study resulted in one teat issue value per sow, which was then used in the statistical analysis. Data were analyzed using SAS GENMOD procedure with Poisson distribution. Teat issues were not affected by toy provision (P=0.88), and there was also no effect of litter size (P=0.71) or sow age (P=0.15). Sows in our study had very low teat issues (MINIMUM: 0, MAXIMUM: 10, MEDIAN: 1). Thus, these EE toys may be more beneficial on targeted commercial farms that have a historically high teat issues in their sows'. The study was funded by the Artz Chair for Faculty Excellence in Animal Science, Iowa Pork Industry Center and the Iowa Farm Bureau Federation. All experimental procedures were approved by the Institutional Animal Care & Use Committee.

Effect of horn status, housing, and management on dairy cows' physiological stress level

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The majority of dairy cows are dehorned or genetically hornless. It is argued that this reduces the risk of injurious and stressful social conflicts. On the other hand, in horned herds, management and housing would need to be better adapted to the cows, e.g. by avoiding changes in herd structure or by providing more space and resources, which would contribute to reducing stress. The aim of this cross-sectional study was to explore the effect of horn status on faecal cortisol metabolites (FCM), reflecting stress levels over the past 9-15h, while taking into account compliance with management and housing recommendations to reduce social conflicts. In 25 loose housed dairy herds (12 horned, 13 hornless), 3-4 faecal samples were collected from 674 cows at intervals of 5-15 d (n=2,625 samples). FCMs were analysed by enzyme immunoassay. A total of 15 housing factors and 7 management factors relating to recommendations for keeping horned cattle were recorded. Each factor was categorised as compliant or (partly) non-compliant, and percentages of compliance for 'housing' and 'management' were calculated. To avoid collinearity, two separate linear mixed models were calculated with the fixed effects of horn status, compliance with 1. housing and 2. management, and the respective interaction with horn status. Cow was always nested in herd as a random effect; days in milk and time of sampling were included as covariates. In general, there was large variation in compliance with recommendations for housing (23-96%) and management (14-79%), though farms with horned herds complied with higher percentages on average. FCM levels did not significantly differ between horned and hornless herds. However, contrary to expectations, no associations with compliance were found. More knowledge is needed about the extent to which FCM levels reflect social stress and whether individual housing or management factors may be particularly important in reducing stress.

Acoustic analysis to identify non-fatal piglet crushing events

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Pre-weaning mortality has a substantial economic impact for the commercial pig sector as well as being a major welfare concern. Mortality rates for individual sows are easily measured, however, non-fatal near-miss crushing or trampling events are less easily identified. Here we present a novel use of acoustic analysis to identify near-miss events on a UK commercial pig farm. Nineteen crated sows in a single farrowing room were continuously video recorded for the first 4 days post farrowing. Two AudioMoth sound recorders also recorded continuously for the same 4 days, giving coverage of the entire room, using a sample rate of 96 kHz. The audio data were analysed using Kaleidoscope Pro software and potential piglet distress calls were visually identified from their unique acoustic patterns. Confirmation of a fatal or near-miss event was conducted from the video at the time point identified from the audio analysis. The number of near-misses in the first 4 days post-farrowing were recorded for each sow and the correlations between this and total pre-weaning mortality for that sow, average daily gain over the pre-weaning period and sow parity were tested. The results showed that over the 4 days, the number of near-misses for each sow ranged from 1 – 10 (3.5 ± 2 (mean ± SD)) and that there was a moderate correlation (r=0.5) between near-misses and over-all pre-weaning mortality (range 0 – 31%, 13.0 ± 10% (mean ± SD)). There was no significant correlation between near-misses and either sow parity or piglet average daily weight gain. Acoustic analysis provides a simple, rapid and cost-effective method of identifying non-fatal near-miss events which may help to identify sows that are potentially more careless and are at risk of having a high pre-weaning mortality rate. This may be particularly relevant as the industry tries to balance pre-weaning mortality rates with a move away from farrowing crates.

An Evidence-based Rating System to Pain Intensity Assessment in Animal Welfare Research

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Translating existing knowledge into evidence that supports or refutes specific hypotheses is a critical challenge across disciplines. Evidence-based frameworks of assessment are used in different fields, including healthcare, disaster risk management, and legal systems. Here we present an evidence-based approach for animal welfare assessments that is standardised and systematic, yet adaptable to different species and welfare assessment contexts. The method is flexible to incorporate variable data and knowledge and remains responsive to new evidence. It is also designed to be transparent, allowing for the scrutiny of each piece of evidence. It consists of three main steps: (1) a review of existing knowledge and evidence, including questions that can guide the assessments, (2) the rating of each piece of evidence against the criteria defining each hypothesis (Ratings: Confirm, Consistent, Unclear, Inconsistent, Reject), and (3) the translation of ratings into probabilities for each hypothesis. We illustrate the method by applying it to estimate the intensity of the pain associated with the surgical castration of piglets without analgesia, including the phases of cutting and/or tearing of tissues, tissue damage and inflammation following surgery, and recovery. The method can be incorporated into most pain and welfare assessment approaches, providing a common framework for translating existing knowledge into support for alternative hypotheses.

Effect of seasonal changes on the incidence risk of tail biting in Australian pigs

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Livestock production and the environment are closely interconnected, with climatic factors affecting both the health and welfare of animals. Tail biting (TB) in pigs is one such welfare-reducing abnormal behaviour known to be impacted by environmental factors such as extreme temperature changes. To understand the prevalence of TB and its associated risk factors in Australian pig production, we conducted epidemiological analyses of data from a perspective cohort study. Over 23 months, data were collected for ~79,552 pigs with docked tails from birth to selection/slaughter, across six sites along the eastern coast of Australia. Of the six sites, five were in a sub-tropical zone and one in a tropical zone. Data pertaining to environmental, animal and management factors were collected. Climatic factors included daily average temperature and humidity levels at both shed/room and site level. In the sub-tropical zone of Australia, the highest proportions of TB were seen during winter (0.35) and spring (0.30), whereas in the tropical zone the highest proportions were seen during summer (0.41) and spring (0.36). Interestingly, these seasons coincided with the wet season (higher rainfall) in the respective climatic zones. Of the 3,658 TB incidents recorded across all sites for the duration of the study, 85% of these occurred during the wet season. Our preliminary data also suggest the sheds/rooms with the highest incidence of TB had temperatures below the thermal comfort level for growing pigs (15C -30C), and humidity levels higher than 70%. The climatic factors described here will be included in a survival analyses alongside other factors to evaluate their biological significance in inducing TB.

Plenary 7. Working equids: linking human and animal welfare under a sustainability framework

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Working equids can be considered as part of the financial, physical and social capital of their owners, as well as a central axis for building resilience capacity. This is why horses, donkeys and their hybrids are an essential component of the livelihoods of millions of families globally, contributing to an immense diversity of activities that not only generate income, but also allow us to meet the sustainable development goals, such as gender equality, poverty reduction, clean energy generation, among many others. These intricate connections between humans and equids allows us to understand how the well-being of each depends on the other (One Welfare framework). Therefore the use of animal welfare indicators such as the presence of health problems or the lack of resources falls short to later on develop animal welfare strategies that are sustainable over time and that do not affect livelihoods. Over the last years working equids welfare assessment has also incorporated a better understanding of their owners perceptions, attitudes and empathy, addressing not only indicators that affect the animals, but also those that can affect the human-equid interaction. The use of positive indicators of animal welfare is also essential, and requires a better understanding of the animals emotional states. Only by addressing animal welfare as a multidimensional and complex concept we will be able to propose long term solutions.

A snapshot look at the prevalence and severity of keel bone damage in cage-free hens in Kenya

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Egg-laying hen welfare issues associated with keel bone (KB) damage are widespread and well-documented in the Global North (GN). However, there is a dearth of knowledge of KB status in the African continent. Though brown commercial layer hen breeds in Kenya are similar, most cage-free housing systems are smaller-scale deep litter barns, unlike the multi-tiered aviary systems in the GN. Direct comparisons with GN figures are tricky also because significantly lower productivity rates (76%; expected: 90%, at average 59 weeks of age (WoA); $p<.05$), and higher feed consumption rates (133 g/hen/day compared to 125 g/hen/day in GN; $p<.05$) are observed. 20 hens from six commercial cage-free farms each were intercepted before slaughter (93 WoA (76-112 WoA)) as a case study of how prevalent and severe KB damage is. KB fractures were scored radiographically. Additionally, two trained vet professionals evaluated KBs from three of the six farms through in-vivo palpation and morphological post mortem assessments. Hens were selected randomly, following a stratified sampling protocol. The overall prevalence of KB fractures was 40% (±16%, 20-65%), within previously published review ranges (13-84.5%) from the GN. The prevalence of KBFs was significantly higher when assessed using palpation (88%; 65-100%; $p<.05$) and post-mortem assessment (88%; 84-95%; $p<.05$), reconfirming the importance of consistent methodology data when comparing results. Radiographic assessments indicated a relatively low average fracture severity score (1.7±1 compared to >2.5 as reported in the GN; using a 0-5 scale; $p<.05$), possibly influenced by differences in housing systems or other potentially protective factors. Most KBs with fractures had single fractures (57%). The incidence of KB deviations was relatively high (65%, assessed post mortem). The results suggest that KB damage can be a significant concern also in cage-free systems in the Global South. However, there might be potential protective factors at play, emphasising the need for further research into preventative measures and promising interventions for such hen welfare issues, taking regional farming conditions and specifics into account.

Welfare Potential of rabbit farming systems

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Many current animal farming systems have a low welfare potential – they do not adequately provide for the animals' physical, emotional, and behavioural needs. Efforts to improve welfare within such systems can be ineffective as the system itself is the limiting factor. The key determinant of welfare potential is the method of production, defined by housing features and/or genetics. Good management cannot increase welfare potential but is essential to ensure that the system achieves its potential. We aim to show how the concept of welfare potential can be applied to achieve real improvements in farmed rabbit welfare. Most rabbits are farmed in barren wire cages with limited horizontal and vertical space. Such systems have a low welfare potential as they severely limit the animals' comfort and ability to engage in basic behaviours such as vigilance, hopping, play, and social behaviour. Attempts to improve caged production led to the development of enriched cages which provide more vertical and total space, a plastic footrest, and a platform. However, these systems still limit physical comfort, behavioural expression, and opportunities for positive emotional experience. Systems with higher welfare potential for fattening rabbits account for a small percentage of commercial production, but there is a lack of higher welfare potential systems for breeding does. Park systems provide more space per rabbit, comfortable flooring, enrichment as well as sufficient horizontal and vertical space to perform basic behaviours. Pen systems provide greater total available space, enabling growing rabbits to express even more of their active behavioural repertoire, as well as additional enrichment possibilities (hiding spaces, gnawing material) and comfortable flooring. The addition of wintergardens can increase the welfare potential of pen systems as they offer the rabbits more space, the chance to move away from other individuals, and a choice over environmental conditions. Systems with pasture access, and appropriate shelter, have the highest welfare potential as rabbits can engage in grazing and digging behaviour. The concept of welfare potential can help guide investments away from systems which can never meet the animals' needs towards those that can deliver a good level of welfare.

Session 8 Theatre 4

Validation guidelines of sensors used for the automatic assessment of animal welfare

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The use of sensor technology to monitor animal welfare continuously is of interest to farmers and other stakeholders. However, for sensor data to be used effectively in welfare monitoring, it is imperative that sensors provide valid and reliable measurements, and sensor data needs to be relevant to animal welfare. Therefore, the validation of sensor outputs is paramount in both commercial and research contexts. Additionally, the establishment of a standardized validation procedure is necessary to ensure the comparability of validation trials and the attainment of reliable outcomes. Within the framework of the aWISH (HEurope, 101060818) and ClearFarm (H2020, 862919) projects, a guideline has been devised to formulate a standardized protocol for sensor validation in welfare assessment, structured into steps organized under two principal blocks. Block 1 pertains to output validation, assessing the accuracy of sensor measurements with respect to their intended outputs, while Block 2 concerns welfare relevance validation, evaluating whether sensor outputs can serve as informative and trustful indicators of animal welfare. This abstract predominantly focuses on Block 2, which encompasses four sequential steps: (1) selection of a welfare consequence under a specific context, (2) identification of validated indicator(s) relevant to the chosen welfare consequence, (3) refinement of validated welfare indicator(s) to align with the outputs of relevant sensors identified in Block 1, and (4) determination of sample size and statistical analysis for the validation trial. Additionally, the limitations of this guideline are addressed, delineating scenarios where its applicability may be constrained. Illustrative case studies involving cattle, pigs, and poultry will demonstrate all steps of this guideline, encompassing a spectrum of prevalent sensor technologies including cameras, microphones, load cells, and a combination of sensors.

Session 8 Theatre 5

Application of on-farm computer vision for development, improvement and validation of motion sensor ear tags to monitor welfare and health for sows

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On-farm observations for detecting health and welfare problems are time-consuming and may overlook subtle indicators due to their subjective nature. This project aims to develop improved tools for health and welfare monitoring of farm animals, with a particular focus on sows. A particularly effective tool is motion sensing ear tags, enabling tracking movements continuously for all animals. Farmers are alarmed at an early stage, and treat animals accordingly for eg. lameness or illness causing abnormal change in movement behaviour. The project introduces a synergistic use of computer vision (CV) technology in conjunction with the motion-sensing ear tags from BioCV for further development of the ear tag system. This integration offers a nuanced view the animal's condition. The project develops algorithms for CV detection of lameness to enhance assessment accuracy and supplies an objective evaluation to verify the ear tag system. Initial development of ear tag algorithms has resulted in a detection rate close to 100 % on lameness. Currently only few animals were included and later work will also focus on distinguishing between degrees of lameness and postures. Our analysis also involved delving into the dataset's statistics and conducting density analyses to glean insights into the acceleration patterns associated with each posture. Subsequent density analyses revealed distinct acceleration patterns characteristic of each posture. For instance, ventral lying exhibited minimal acceleration across all directions, while standing manifested high upward acceleration along the z-axis. Applying a feedback loop from computer vision to improve precision of health and welfare monitoring leverages further insights into the BioCV´s ear tag algorithms thus improving the ear tag system. Ultimately, this project strives to set new standards for farmers tools to detect animals in need of care thus promoting animal welfare.

Session 8 Theatre 6

Cattle powered Internet of Things (IoT) communication system for activity detection

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The use of IoT wearables for livestock management is a growing trend. Sensors that measure and transmit activity and health status are embedded in wearables that can be mounted externally on the necks, ears, legs or tails of farm animals. Traditionally, batteries were used to power these devices, but battery replacement is labor-intensive and environmentally harmful. Kinetic Energy Harvesting (KEH) presents a potential solution. Using a prototype KEH device, kinetic energy from cow locomotion was collected and converted to electrical energy to power a low-power IoT device, eliminating the need for batteries. An IoT/edge/cloud continuum has been developed, in which the wearable was integrated to operate as an IoT node. As fields can cover vast areas, a long-distance protocols is needed to communicate between the IoT device and the edge. The KEH device further limits the protocol choice due to lower power availability from harvesting. For transmitting between the IoT device and the edge, the Long Range (LoRa) protocol was chosen as it can perform energy-efficient transmissions between resource-constrained devices. Once the LoRa messages reach the gateway (GW), the edge device translates them into application layer protocol messages in order to forward them to the cloud, where the compute-intensive and therefore energy-intensive tasks are performed. The system was tested in the lab and in the field on a cow, utilizing inexpensive hardware and open-source software for the wearable and the GW, as an alternative to current proprietary and expensive solutions. In the lab, experiments were conducted to show that the designed gateway solution can receive messages from multiple sending devices and a collision avoidance mechanism has been implemented and tested. In the field, over the course of several days, the temperature of a free-roaming dairy cow in a pasture was measured at the cow's collar and transmitted to a GW outside the pasture. Results demonstrate that our system is capable of collecting sufficient energy to send between 29 and 128 messages from the cow's collar to the GW within a single day. This reflects the potential of the KEH device as an activity sensor.

Session 8 Theatre 7

How do individual pigs change their feeding patterns during welfare issues?

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Sensor technology offers the potential to monitor growing-finishing pig welfare by detecting behavioural changes in response to welfare issues. How validly issues are identified, however, depends on how such behavioural changes differ between pigs. This study quantified the individual variation in feeding pattern changes during health issues and heat stress, for all pigs and subgroups of pigs with specific physical traits (i.e. issue severity, body weight, sex, age) or feeding strategies (i.e. nibbling/meal eating, fast/slow eating, day/day-night eating, consistent/inconsistent eating). During four growing-finishing rounds (n=110 pigs/round), feeding data were collected continuously with electronic feeding stations. Ten health issues (a.o. lameness, ear/tail/flank damage) and heat stress were identified using twice-weekly farm visits and climate sensors. For each pig, generalised additive models were used to quantify feeding patterns across days (i.e. intake, duration, frequency, rate, night intake and circadian rhythm strength) and estimate changes in these patterns during welfare issues. Variation in estimates between pigs was visualised and subsequently split across subgroups of pigs using meta subgroup analysis. Across feeding patterns, we found that 87±1% of pigs did not noticeably change their behaviour during health issues ($P>0.05$), while the remainder showed both positive and negative changes. Certain subgroups of pigs had more consistent responses, such as reduced feeding frequency in heavier pigs ($P=0.03$) and nibblers ($P<0.01$) and reduced intake in slow eaters ($P<0.01$) during lameness. During heat stress, up to 77% of pigs reduced and no pigs increased their feeding activity, regardless of subgroups. As individual pigs respond differently to the same health issues and most pigs do not respond at all, we conclude that detection of health issues from feeding patterns is difficult. It seems, however, feasible for some subgroups of pigs and health issues, and heat stress detection is realistic. Our findings explain why current algorithms detecting health issues in pigs from behavioural changes underperform.

With adequate drinking facilities, short-term restrictions on access to drinking water for lactating dairy cows disrupt their time budget but do not limit their water intake

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Several milking practices commonly used on dairy farms, can result in a temporal restriction of the access to drinking water for cows. The aim of this study was to investigate the effect of 3 modalities of temporal restriction of access to drinking water on the individual behavior of cows and on physiological indicators of dehydration. Four treatments (CTRL = free access to the drinker and feed fence, HL = 2 hours of headlock at the feed fence after morning and evening milking, D2H = free access to the feed fence and no access to water for 2 hours after milking and D4H = free access to the feed fence and no access to water for 4 hours after milking) were compared on 4 groups of 10 lactating dairy cows using a 4×4 Latin square design. Each period lasted 1 week and each group of cows was housed in a pen equipped with 1 electronic drinker, 10 individual feeders and 2 cameras, within a free stall barn. Social hierarchy was characterized by normalized David's scores based on replacements at the drinkers detected by video. For the last 4 days of each period, drinking behaviour was measured using connected drinkers and eating and lying times were measured using accelerometers. Plasma indicators of dehydration were analysed on the last day before milking and milk composition was also determined. Regardless of their social category, cows drank the same daily amount of water regardless of treatment but, compared to CTRL, they increased their drinking rate and the frequency of their drinking bouts with HL, D2H and D4H and decreased their drinking time with D4H. Compared to CTRL, the lying times decreased at 1000 h with HL, at 1100 h with D2H and at 1200 and 1300 h with D4H, which could be a sign of discomfort for the cows. At both milkings, the milk freezing point was higher with HL, D2H and D4H than with CTRL. In contrast to the other social categories, subordinate cows did not increase the duration of their drinking bouts and the time of drinking interruption within bouts in D2H compared to CTRL. Cows appear to successfully meet their water requirements with short-term water restriction in the situation of drinking facilities that meet the recommendations.

Effects of gestational olfactory enrichment on adaptation to weaning in pigs

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Pigs are capable of prenatal olfactory learning, which is context-dependent and can have long-lasting behavioural effects upon odour recall. In conventional farms, the use of odours to enrich the environment may offer a simple and cost-effective strategy to enhance welfare of pigs. We aimed to evaluate whether the recall of an odour perceived in a positive context during prenatal life would promote better adaptation to weaning in piglets. Fifty gestating sows and their piglets were used in two replicates. In each replicate, enriched sows (n=26) had access to an enriched and odorised (anise) room 3 times/week for 2h throughout gestation. Each visit was paired with the ingestion of aniseed sugar cubes. Control sows (n=24) were continuously kept in a barren pen. At weaning (d28), piglets from each prenatal treatment were allocated to an odorised or non-odorised room, resulting in 4 prenatal x post-weaning treatments (n=12 pens of 4 piglets/treatment). Piglet behaviour was recorded using 5-min scan sampling for 6h/day on d28 and 29. Salivary cortisol was measured on d25 and 29. Feed refusals and piglets were weighed on d29, 35 and 42. Prenatal treatment did not affect post-weaning weight gain, but compared to piglets from control sows, piglets from enriched sows ate more in the first 24h post-weaning ($p<0.001$). They also spent more time at the feeder ($p=0.002$) and tended to spend less time exploring the pen ($p=0.06$) on d28 and 29, and more time playing on d28 ($p=0.08$). In the odorised post-weaning room, piglets prenatally exposed to odour spent less time aggressing pen mates than non-exposed piglets (prenatal treatment x post-weaning treatment, $p=0.04$). Male piglets from enriched sows had lower cortisol concentrations than male piglets from control sows on d25 and 29 (prenatal treatment x sex, $p=0.007$). Compared to piglets from the control room, piglets from the odorised room spent more time at the feeder on d28 and 29 ($p=0.03$), but also more time aggressing pen mates on d29 ($p=0.03$). While the effects of odour recall in the post-weaning environment were scarce, providing gestating sows with regular access to an enriched environment positively affected stress-related behavioural and physiological responses of their piglets at weaning.

Good or poor welfare: How many animals do I need to assess for a reliable decision?

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Animal-based welfare indicators should play an important role in animal welfare monitoring programmes or farm certification. The assessment of these indicators, however, is time-consuming. In addition, the number of animals required for drawing conclusions from the sample regarding the true prevalence in the population (herd) often results in impractical assessment durations, especially if animals need to be caught for assessment. A common approach is to determine whether the prevalence of, e.g., lameness exceeds a specified threshold value. This approach usually requires a smaller sample size than directly estimating the prevalence with high accuracy, but the number of required animals, and thus the time for inspection, may still be considerable. Several statistical approaches are available to determine whether a population prevalence is significantly below or above a specified threshold, e.g. sampling in order to detect disease, or one-sample proportion test, using either the exact or other approximate z-tests. We will present a selection of methods with their advantages and disadvantages under varying conditions, that is, with different herd sizes, threshold values, or deviations between the true prevalence and the specified threshold. For example, in order to detect disease in a herd containing 100 animals, a sample of at least 25 animals is required to detect at least one sick animal with 95% minimum certainty, if the assumed true prevalence in the herd is at least 10%, while a sample of at least 78 animals is required, if the assumed true prevalence is 2%. We will focus on explaining the sampling methods using hypothetical herds, in which all animals are kept in a single group. In addition, we will present the general principles to consider for sampling on real farms, with animals clustered in several groups, rooms or buildings. Our aim is to point out possibilities for reducing the number of animals to be assessed on farm, thus limiting the duration of inspection, while still achieving reliable results.

Use of PLF daily measures to estimate the effects of extended heat stress in dairy cows on rest time

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The aim of this study was to investigate the effect of prolonged (from 1 to 6 days) heat stress in dairy cows on rest time thanks to the use daily records based on the Afimilk system. Afimilk is a herd management system that allows automatic, accurate daily to hourly measures such as rumination time, steps, rest time and heat detection. The study was conducted from 2020 to 2022 in one of the largest dairy farms located in Northern Italy. The farm included 1,600 Holstein Friesian cows all measured daily for production and behavioral traits. Furthermore, Temperature-Humidity Index (THI) was used as climate indicator, calculated based on the equation by Vitali et al. (2009). Rest time was measured as the total time in minutes when a cow lays down in 24 hours. Results showed that rest time was the trait most affected by the increased THI. In detail, rest time was immediately affected by high THI and decreased already at THI between 51-54 points. However, comparing 1 and 6 days of continuous heat stress identified that at rather low THI values (57-60) the resting behavior of the animals decreases more evidently with a prolonged condition of heat stress (6 days). While when THI was over 72 for 1 and 6 consecutive days in mean (>72) rest time increased slightly. This behavior can be attributed to the activation of the ventilation system in the barn that aids the cows to manage better heat stress and to rest longer. In addition, our data confirms that primiparous cows rest more than 2nd and 3+ lactating cows. In conclusion, the results of our study indicate that heat stress reduces rest time in dairy cattle and that barn ventilation improves animal welfare. References Vitali, A., et al., 2009. Journal of Dairy Science 92, 3781–3790. https://doi.org/10.3168/jds.2009-2127

Session 8 Poster 12

The effects of rearing kids with non-lactating goats on kids' behavioral development

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Dairy goat kids are generally separated from their mothers shortly after birth and reared in peer-group without adults. This study aimed at evaluating the effects of the presence of two non-lactating goats on kids' behavioral development. Twenty-four kids were allocated to two groups according to birth weight and age: artificial rearing with non-lactating goats (NL) or without adults (AR). Both pens were divided in two areas: a larger, common with adults in NL group, and a smaller one for resting and access to specific food. Behavioral observations using scan-sampling were carried out by one observer for 6 hours, twice a week, from two weeks of age until separation from the two goats at 60 days of age in mean. At 1.5 month, the kids' reactions were assessed in an isolation test and a choice test between the familiar goats and unfamiliar ones. Data were analyzed by ANOVAR, ANOVA or non-parametric tests accordingly. NL kids were observed more often lying over the trial and less often in the common zone with the goats the first week of observation than AR kids. In the isolation test, no differences between the groups were found, but high vocal activity was observed in all kids (M±SE=114±22.5). On the contrary, in the choice test, NL kids tended to bleat less (P= 0.0501), reached the familiar goats faster, spent more time near them and explored more the familiar goats' barrier than AR kids (Ps<0.05). Being reared with non-lactating goats in our conditions seemed to have little effect on kids behavior and reactivity. However a preference towards the familar goats seemed to be expressed during the choice test. The significance of this preference will be discussed.

Session 8 Poster 13

Can science keep up with the policy to ensure banning piglet castration?

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Castration of piglets impairs animal welfare, increases gas emissions, is not accepted by the public, impairs feed conversion, and decreases farmers' economy accordingly. Thus, theoretically, ending piglet castration could benefit both the farmers and the animals. The main reason for piglet castration is the accumulation of different compounds in the fat tissue once the pigs are sexually mature. In a low percentage of entire male pigs, these compounds accumulate in a concentration that leads to bad odour of the meat (boar taint), which can be noticed only after cooking. The EU has been aiming to ban piglet castration since 2018, but up to date, failed to do so. There are two compounds that are known for their accumulation and being part of boar taint (androstenone and skatole). Human nose as compared to the analytical methods for measuring directly these compounds, shows about 30% of false positive and false negative. But is it really false, or does the human nose detect beyond our current knowledge? The scientific gap of knowledge for the complete understanding of boar taint, as well as the lack of technological methods to detect it on the slaughterline, made surgical castration remain the common procedure. As part of our new development, advanced optics and artificial intelligence (AI) were used for the detection of boar taint on the slaughterline. This new approach detected in the accuracy of more than 90% the presence of boar taint, taking into account both skatole, androstenone, and the unknown chemical fingerprint detected by the human nose. Perhaps, banning piglet castration with a longer transition time can push the industry to the development, funding, and acceptance of such investions. Otherwise, keeping postponing legislation, impairs pigs' welfare, the environment, and the farmers.

Session 8 Poster 14

Effect of human-animal relationship quality on productive performance and adrenal cortex morphology in pigs

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The impact of human-animal relationship quality on farm animal welfare and productivity is well-established. This study aimed to explore the long-term effects of human handling quality on nursery pigs' productive performance and adrenal morphology. Thirty-six 21-day-old female pigs were assigned to one of three treatments (12 pigs/group, 4 pens/treatment): Positive Human Handling (PHH), involving gentle stroking and scratching; Negative Human Handling (NHH), exposing animals to acute stressors such as capture, pursuit, and attempts to place a rope around the snout (ethical approval Certificate No. 22552); and Control Group (CG), receiving minimal handling for routine husbandry practices. Both PHH and NHH treatments were applied for 2 minutes, twice daily, for six weeks (days 17-61 of the study). Average daily gain (ADG) was estimated over three periods: weeks 1 to 3, weeks 3 to 5, and weeks 5 to 8 of the study. Two weeks after the treatment application ended, pigs were slaughtered, and the left adrenal gland was retrieved for cortex histological analysis. Productive and morphological data were analyzed using ANOVA and Kruskal-Wallis tests, respectively, using SAS® software. ADG differed among treatments in weeks 5 to 8 ($F_{6/33} = 4.29$; $P=0.002$), with PHH pigs presenting higher ADG compared to NHH ($P=0.03$) and CG ($P=0.01$). Adrenal cortex morphology also differed among treatments ($X2=8.95$; $P=0.01$); NHH pigs had larger fasciculata zona than PHH ($P=0.05$) and CG ($P=0.004$). No differences were observed in the reticularis and glomerulosa zones among treatments ($P>0.05$). Positive handling improves growth rates, while negative handling is related to chronic stress, with significant adrenal cortex morphology alterations. These results highlight the impact of the positive human-animal relationship on stress response and production efficiency, thereby promoting overall animal welfare.

Session 8 Poster 15

Effects of temperature on the behaviour of group-housed dairy calves during the pre-weaning period

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The aim of this study was to determine how temperature affected calf behaviour during the pre-weaning period. Female dairy calves (n=47) were allocated to 1 of 3 pens based on birth date and reared under conventional Irish management conditions; after 3-4 d in individual pens, calves were moved into group pens where they had ad libitum access to hay, water, and concentrates. Milk replacer (6 L/d) was fed through an auto-feeder; calves were gradually weaned from days 42 to 84. A 24h period/week of video recording was used for behaviour scoring for 8 consecutive weeks (scan sampling at 10 min intervals). Behaviours included posture (lying or standing) and activity (19 behaviours). Only healthy calves were used in the analysis (n=39). Behaviour proportions were analysed using generalized linear mixed models. On days when the shed temperature was <4°C compared to ≥6°C, regardless of their age calves spent more time lying (percentage mean ± standard deviation; 75.9±5.27% vs. 72.3±5.78%; $P<0.001$) and less time eating concentrates (0.8±1.11 vs. 1.4±1.49%; $P=0.028$), eating forage (0.8±0.91 vs. 1.5±1.57%; $P=0.007$), eating bedding (2.7±2.87 vs. 4.0±4.78%; $P=0.003$), and walking (1.5±1.20 vs. 2.0±1.40%; $P=0.023$). Rumination was also affected ($P=0.049$) by lower shed temperature but no comparisons differed; social interactions tended ($P=0.085$) to be affected. These findings highlight the importance of proper temperature management in calf housing and the risk low temperatures may have on calf feeding behaviour and subsequent rumen development.

Session 8 Poster 16

Shout it out loud – Effects of the rearing system on vocalization of turkey chicks

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In the present study, we hypothesized that turkey chick vocalization was influenced by the early post-natal period. Therefore, we analyzed the influence of two rearing systems (RS) either with an adult foster mother (RS 1, N=40) or without an adult animal (RS2, N=40) on call characteristics in an Open Field/Novel Object test (OFNO). In four rearing periods, ten animals per RS were tested for ten min each, with the novel object being introduced after 5 min. Using the software Avisoft, calls were manually labeled, and number of calls, call duration and intervals, entropy, peak frequency, as well as the 25, 50 and 75 quartiles were measured. Parameters were analyzed using linear mixed models, with the rearing system (RS1/RS2) and the test section (OF/NO) as fixed and the animal as random factor. No effect of RS could be found on any of the analyzed parameters. However, section had a significant effect on all measured parameters, as did the interaction between RS and section for all parameters except peak frequency. Pairwise comparisons revealed that number of calls and entropy decreased after the introduction of the novel object in chicks from RS1, but not from RS2. Therefore, even if RS had no direct effects on call characteristics, the significant interaction between RS and time could indicate that chicks habituate to the test situation differently, which should be analyzed further in future studies.

Session 8 Poster 17

Prioritizing Equine Welfare: Implementing the '3Fs' for High-Level Sport Horses

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Societal concerns for animal welfare extend to all domestic species, including high-level sport horses. The welfare of these horses, notably highlighted during recent Olympics, has garnered significant public interest, prompting inquiries into their living conditions. Studies have emphasized three key factors conducive to equine welfare: unlimited access to forage, freedom of movement, and social interactions with peers, commonly referred to as the ”3Fs” – Forage, Freedom, Friends. However, the feasibility and benefits of implementing these factors specifically for these horses remain unexplored. Indeed, they face unique challenges such as extensive travel, limited time in their stables, weight management, and high economic value necessitating careful monitoring. Consequently, restrictions on feeding, freedom, and social contacts are often deemed necessary. This study aims to assess the feasibility of providing high-level sport horses with the 3Fs within their usual stable, evaluating its impact on their body condition, injury risk, and welfare. Observations were conducted on 54 high-level sport horses from 13 stables, assessing their behaviors and welfare using scan sampling and the AWIN horse protocol. Their living conditions were recorded. Results indicate that a proportion of these horses have living conditions that respect the 3Fs: 49% had unlimited forage access, 73% had olfactory (59%) or tactile contact (14%) with other horses, and 61% had regular access to outdoor paddocks (21% of them live predominantly outside in paddocks or pastures). Horses with unlimited forage access did not significantly differ in body condition compared to those with restrictions (Mann-Whitney U test, $P=0.49$) and those housed with peer access did not exhibit more injuries ($P=0.25$). In terms of abnormal behaviors, 19% displayed stereotypies, 1% anxiety, and 0% apathy. These proportions are lower than what was observed in lower-level competitive horses. Additionally, horses with living conditions respectful of the 3Fs displayed significantly fewer abnormal behaviors ($P<0.05$). These findings highlight the feasibility and importance of implementing the 3Fs, even for high-level sport horses.

Session 8 Poster 18

Reconsidering abnormal behaviour measurements in the WelFur Fox protocol

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Two parameters in the WelFur Fox welfare protocol measure the prevalence of abnormal repetitive behaviours (ARB): 1. Fur damage (furD) indicates fur chewing behaviour and 2. Hour-long observations assess the prevalence of all other ARBs. Based on WelFur observations, ARBs are rare (< 0.1% per farm in 2020) in blue foxes. Factors like assessor presence might, however, affect the outcome. Our study provides new information on ARB categories in blue foxes and suggests ways to improve WelFur Fox ARB measurements. The study took place at Kannus Research Farm Luova, Finland, from August 2019 to February 2020. It involved 38 young female blue foxes in a 2*2 factorial design, with Enrichments (E) and Concealment Screen (S) as factors. The E group received two additional enrichments changed biweekly, while the Basic group (B) had a wooden block. All animals were weighed monthly alongside furD assessments and video recorded for 48 h in February. Behavioural sampling with a 1-minute IS interval monitored ARB categories. The IS-scores of the most prevalent ARB categories, scratching/digging (scrabbling, 34 foxes) and oral ARB (22 foxes) averaged 1.10-1.20 (% of active time). Utilizing a fitted local polynomial regression model, scrabbling increased as the animals lost more % of their bodyweight (p=0.02). A logistic regression model (LR) indicated that oral ARB (OR = 0.06 p = 0.001) could be mitigated with E, as 85% of foxes in the B group exhibited oral ARB, whereas the corresponding value in the E group was 28%. Furthermore, the LR for furD suggests that the 11 foxes with furD may exhibit more ARBs in general (ISmean: 4.7 ± 5.1) compared to the one's with undamaged fur (ISmean: 2.3 ± 3.2; PES = 0.1, p = 0.02). This study showed that the most common ARB categories of blue foxes, scrabbling and oral ARB, decrease with balanced feeding and enrichment. FurD may reflect the occurrence of other ARBs, but this association requires more research. Our study supports re-evaluation of stereotypic behaviour observations, as furD may reflect fox welfare more broadly than assumed.

Session 8 Poster 19

Trend analyses predict increasing heat stress for livestock during summer months in Northern Germany

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Farm animal health and welfare can be negatively affected by heat stress caused by climate change and global warming. Trend analyses can help assessing the impact of local climate change to investigate potential heat stress (HS). This study analysed trends of HS in Northern Germany using enthalpy (h) values calculated from weather data of the past 50 years. Yearly data from 23 weather stations in Lower Saxony, provided by the German Weather Service, were collected, focussing on the summer period (May to September), and analysed retrospectively. Data contained the daily h maxima which were categorised to one of the HS classes for poultry and cattle (HS0: <50 kJ/kg = no HS, HS1: 50 to <58 kJ/kg = mild HS, HS2: 58 to <67 kJ/kg = moderate HS, HS3: ≥67 kJ/kg = severe and extreme HS). The maximum daily h values were assigned to the HS classes, their frequencies were determined, corresponding HS trend lines were created and their gradients were specified. Finally, significant increases in the HS trend line gradients were analysed using the Mann-Kendall test. Maximum daily h values were recorded between 8.0 and 84.9 kJ/kg. Classification into HS levels over all locations and years revealed the following frequencies: 79.8% of h values were assigned to HS0, 14.7% to HS1, 5.0% to HS2 and 0.5% to the class of HS3. The gradient of all trend lines for all HS classes ≥ HS1 was positive and increased significantly. Thus, the presented study showed that the trend towards periods without HS (HS0) led to fewer days from year to year. In HS classes ≥ HS1 with at least moderate HS, a significant increase of days with HS inducing h values was predicted. Therefore, it can be expected that livestock production will face greater challenges in coping with HS in future.

Session 8 Poster 20

The effect of the introduction of stress-reducing measures on the productivity of dairy cows

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Animal welfare usually refers to 3 aspects: does the animal functioning well; does the animal feel well; can the animal express natural behavior. The objectives of this study were to analyze the dairy cow housing system after the introduction of welfare-enhancing factors (playing specially selected music, replacement of farm lighting, installation of massage brushes), to observe cow welfare and to analyze the changes in the productivity of dairy cows before and after the introduction of stress-reducing factors. The behavior of the cows in the pen during day time was recorded by video cameras over 7 days during winter time in a free stall housing system. For analyses, we computed the following dependent variables: number of lying cows per hour, number of ruminating cows per hour; time spent ruminating per hour; number of aggressive interactions per hour. For evaluation of animal performance, we analyzed milk recording data. Cows must be provided with the opportunity to lie down, and if such an opportunity is not provided, animal welfare is at risk. During our observations, the average number of cows per pen was 48, and the number of lying cows per hour varied from 11-26% of the total number of animals, on average 18.6%. One of the main activities that cows engage in while lying down is rumination. A healthy herd can be judged if at least 40% of the cows are ruminating during the day. In our observations, the number of ruminating cows per hour varied from 20-36% of the total number of animals, on average 27.4%. The duration of rumination can vary from less than 30 minutes to several hours for each animal. In our investigation, the average duration of rumination lasted 53 min. According to Animal welfare guidelines, abnormal activity should be seen in less than 10% of cows, and during our observations, the average number of aggressive interactions was very low and reached only 1,1%. After introducing some welfare-improving factors, the average milk yield increased by 27.6% ($P<0.05$), and the urea content in milk significantly decreased by 16.4% ($P<0.05$), while there was no significant effect on milk fat and protein content. Based on these findings we recommend that owners should pay more attention to improve animal welfare.

Session 8 Poster 21

Impact of Music Played in the barn on dairy cows milk productivity

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Beautiful music stimulation can promote the structural changes of the animal's auditory nerve center, affect the animal's physical functions. The he aim of our studies was to investigate the effect of music on the milk productivity of dairy cows. The research was conducted 60 days in winter time on a Latvian commercial 3 organic dairy farm (A,B, C) with different breeds in each farm. In farm A we used breeds Latvian Brown 61%, Holstein Red 25%, Holstein Black 7% and other 7%, together 3 lactation 40 dairy cows. In farm B in study included Latvian Brown 6%, Holstein Red 15%, Holstein Black 68% and 11 % other crossbreed cows. In this farm we use 30 dairy 3 lactation cows, but in farm C we had for research 40% Latvian Brown ,34% Holstein Black and 26% Holstein Red 4 lactation 40 dairy cows. The all cows selected for study were approximately in 140 lactation day with similar weight and physiological condition. The selected 27 music pieces of classical and popular pop music played inside barns 8 hours 30 days in day time and 30 days period cows stayed without music. Cows are able to hear a frequency spectrum from 23 Hz to 35 kHz which includes part of the ultrasonic range from 16–35 kHz. The cows were fed according to their needs as well as the welfare rules were followed. Data on daily milk yield, were recorded. At cow level, mean values without and with music were calculated, and analyzed by t-tests. The results show that in barn A daily cow milk yield significantly differed ($P<0.001$) between research periods. In music period data were 19.4±0.41 kg, but in period without music 15.4±0.34 kg. Difference in cow milk yield was 26.6%. In farm B the results were without signifficantly differences. Daily milk yield 22.1±1.81 kg and 21.5±0.39 kg, respectively in music and non music periods. On the other hand, in farm C, there were significantly differences ($P<0.05$) in milk yield (19.5±1.01 kg and 16.6±1.11 kg) between the research periods. Difference in cow milk yield was 17.6%. In conclusion, selection of speciall music increased the milk yield of cows by 17.6 till 26.6%, respectively in C and A farms with significantly differences, but in farm B without differences. In each farm we had different cow breeds.

Happy wings: Multifunctional elevated platforms to improve litter quality and broiler chickens welfare in commercial farm

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Environmental enrichment with elevated platforms is an emerging approach to improve broiler chickens welfare. The objectives were to investigate the effects of elevated platforms with additional functionalities (cooling system and manure collection) on litter quality, welfare indicators and performance, and to test whether a cheaper cooling system material (plastic instead of steel) affected the platform' use. 10.000 one-day-old chicks (Ross 308) were allocated to 4 compartments for 36 days. 2 compartments were enriched with 6 platforms each (3 with steel and 3 with plastic cooling systems) and 2 compartments served as control. 241 birds per compartment were weighed at d1 and d30. The platforms' occupation was recorded daily. Litter quality was scored weekly and manure collected on the trays under the platforms was weighed and removed weekly. At d32, the dry matter, pH and electrical conductivity of the litter were evaluated. At d36, 40 birds per compartment were scored for plumage cleanliness, footpad dermatitis and hock burns. Statistics were performed using R, least-squares test was used for linear regression analysis and scores were analysed with Chi-square test. Platforms' occupation and manure quantities increased with age ($p<0.001$), but both did not indicate a preference between plastic and metal cooling systems ($p=0.265$, $p=0.603$ respectively). Platforms did not significantly affect the performance parameters (weight, average daily gain and mortality rate), nor any of the litter characteristics apart from the subjective litter scores (at starter phase $p=0.023$, at grower and finisher phases $p<0.001$). Broilers from the enriched compartments, showed less footpad dermatitis, fewer hock burns and cleaner feathers ($p<0.001$). This study revealed that the enrichment of a commercial farm with elevated multifunctional platforms improved the litter quality and associated welfare indicators without compromising broilers performance.

Effects of Smoke Exposure on Cattle Hematology Using Wildfire Smoke Simulations

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Assessing the effects of wildfire smoke exposure proves challenging due to the unpredictable nature of fires, which hampers researchers' ability to examine this phenomenon. We have developed an indoor wildfire smoke simulation to evaluate the effects of smoke exposure on beef cattle health, performance, and behavior. Eight heifers (Angus x Hereford, 532 kg; 8 months) were acclimated to individual pens in a closed barn for 7 days (d -7 to -1). Heifers were maintained in the barn for 36 days and exposed to wildfire smoke simulation for 7 consecutive days (d 0 to 7). Heifers were individually fed hay, and intake was recorded daily. Health scores were collected daily from each heifer by trained technicians, and blood samples were collected weekly (d -7, 0, 7, 14, and 28) for evaluation of multiple variables. Heifer behavior was recorded continuously for the length of the study. Air quality was monitored daily every 1 minute. Preliminary data were analyzed using MIXED procedure of SAS. Heifers were considered the experimental unit, serving as its own control, and variables were analyzed over time. Air quality, assessed with the concentration of particulate matter2.5 , changed over time ($P = 0.0001$), reaching a daily average of 159 ug/m3 during the smoke simulation period. Blood hematology revealed changes in the percentage of lymphocytes, monocytes, and neutrophils. Lymphocyte percentage increased ($P = 0.001$) from d -7 to post-smoke exposure (d 7), while the percentage of monocytes ($P = 0.005$) and neutrophils ($P = 0.001$) decreased in the same time frame. These data suggest an inflammatory response due to smoke exposure, which could lead to reduced cattle performance and changes in behavior. This research was approved by the OSU IACUC committee (#2023-00354) and supported by the USDA-NIFA, Award #2023-68008-39173.

Session 8 Poster 24

Developing a Sheep Dental Disorder Protocol for Future Welfare Assessment

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Sheep are grazing ruminants relying on a functional incisor apparatus for successful grazing to experience good welfare in challenging environments. Dental disorders in sheep are common and potentially painful, leading to the loss of incisor function, decreased grazing ability, reduced feed intake, live weight and milk production. The impaired functionality of the incisor apparatus in sheep significantly contributes to their premature culling from flocks globally. Despite the importance of incisors, there has been a notable scarcity of research on dental disorders in sheep, especially the potential implications for sheep welfare. We summarise the development of an incisor assessment protocol for sheep, which introduces a novel approach of evaluating the incisors' lingual aspect, departing from previous sheep incisor examinations focusing solely on the buccal (front) view. This enables assessment of excessive wear by considering exposure of the pulp chamber. 1980, 10-month-old Merino ewes and 434 20-month-old Dohne Merino were assessed on seven farm sites in Australia. Photographs of the incisors were taken with the ewe upright in a Vee-Ezy sheep handler; image capture took around 60 seconds. Dental assessments was conducted on the images. Thirteen percent of the 10-month-old ewes and 33% of the 20-month-old ewes exhibited excessive wear, with a mean of two teeth per affected ewe showing pulp necrosis. Generalised pitting enamel hypoplasia was seen in 8% of ewes. This genetic condition can increase susceptibility to decay and sensitivity. Localised hypoplasia, which also leads to compromised enamel and is caused by trauma or inflammation during enamel development, was detected in 1% of 10- and 20-month-old ewes. Two talon cusps and two geminated incisors were detected, never previously documented in sheep. Five 20-month-old ewes were found with dental caries in permanent incisors. This protocol will now be used to research pain associated with incisor disorders. The protocol will be a user-friendly sheep dental assessment to provide production benefits, reduce unnecessary culling and improve welfare.

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Assessment of welfare in pigs with docked and undocked tails from post-weaning to slaughter

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In Italy, from 2024 at least 15% of pigs in each farm should be reared with entire tails. This study evaluated the welfare conditions of docked pigs (D; 144 in post-weaning phase and 96 of the same subjects in fattening phase) and undocked pigs (UD; 151 and 95 pigs, as above) reared in a commercial farm by assessing Animal-Based Measures (ABMs; Welfare Quality, 2009), and cortisol (CORT) and dehydroepiandrosterone sulfate (DHEA(S)) in bristle matrix shaved between the ear and the shoulder. ABMs were evaluated 7d,28d,56d after the beginning of the post-weaning phase and 60d,120d,180d after the beginning of the fattening phase while bristles were collected using the shave and re-shave method at the end of the two phases (85 and 270 d of life). Pigs were reared in boxes with slatter floors providing space and enrichment as required by the EU legislation. In both phases, the experimental unit for ABMs measures was the pen, with D and UD pigs, while hormonal evaluations were considered individually. The statistical analysis was performed separately for the two phases. In the post-weaning phase UD pigs had a significantly higher number of both body and tail lesions than D ones (31.9% vs. 17.8% and 12.3% vs. 1.1%, respectively; $P \leq 0.01$) while in the fattening phase, UD had a significantly higher number of tail lesions (1.4% vs. 0.0%; $P < 0.05$). Tail posture showed a better emotional state in D pigs in post-weaning and fattening phases (94% vs. 68% and 97% vs. 87% of pigs; $P = 0.01$ and $P = 0.07$, respectively). Regarding hormonal profiles, the ratio CORT/DHEA(S) showed no differences between D and UD pigs in the post-weaning phase while it was higher in UD ones at the end of the fattening cycle (0.09 vs. 0.07; $P < 0.05$). Overall, it can be hypothesised that subjects with D tails present a lower chronic elicitation of the HPA axis than those UD at the end of their life. The results emphasise the need for integrated approaches to better assess, understand and promote pig welfare under commercial conditions.

Session 8 Poster 26

Does odourised straw impact the welfare of growing pigs when tested on-farm?

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The importance of outlets for pigs to explore their surroundings highlights the necessity for suitable enrichment materials in commercial housing to prevent behavioural problems like tail biting. Although studies have shown the efficacy of straw provision in reducing such damaging behaviours practical limitations impede its effectiveness, requiring alternative solutions. This study aimed to improve welfare of growing pigs by adding odours to enhance the enriching properties of straw. Conducted at a Swedish pig farm over 12 months, the study comprised 1600 growing pigs housed in groups of 10 pigs each. Eighty groups served as controls with no treatment (normal straw provision on the floor), while the remaining were assigned to four treatments: odourised straw provided in a rack with odour changing either every week (1) or every weekday (2), or non-odourised straw either in a rack (3) or on the floor (empty rack) (4). Essential oils of lavender, aniseed, ginger, thyme and pine were used in the odourised treatments, and mineral oil in the odourless. Weekly welfare scores by trained observers included ear and tail damage, snout irritation, and body cleanliness. The scores were analysed using mixed-effects models with a negative binomial distribution. Preliminary analysis revealed a significant increase in welfare scores (i.e., worsening in welfare) over time ($P < 0.001$). While treatments did not significantly affect tail, ear, or body welfare scores ($P > 0.05$), treatment impacted snout irritation. Pigs with daily odour changes had significantly lower snout irritation than control pigs ($P < 0.05$). These preliminary findings suggest that adding odours to straw provided to pigs did not affect all aspects of their welfare. Further investigation into behaviours like play and straw manipulation is warranted to understand the full impact of odourised enrichment materials.

Session 8 Poster 27

Influence of feeding intensity on body surface temperature in dairy cows

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The influence of different feeding intensities on body surface temperature (BST) in dairy cows needs to be investigated, especially with regard to heat stress conditions and animal welfare. Aim of this study was to investigate the influence of a high-input (HI) and a grass based low-input (LI) diet on BST of lactating dairy cows. We hypothesized, that HI, compared to LI is associated with an increased BST because of higher metabolic activity. The BST of 49 German Holstein cows in an organic system was measured. The cows were divided into two feeding groups (HI: n=25; LI: n=24), kept under identical conditions. The two rations mainly differed with regard to the amount of concentrate and maize silage and the associated differences in expected milk yields (HI: 9000 kg/cow/year; LI: 7200 kg/cow/year). The BST were measured at four body regions on both sides of the body (eye, flank, Fossa paralumbalis, udder) at 50 cm distance using infrared thermography. The measurements were repeated three times per session on seven sessions distributed throughout summer. Several temperature-humidity loggers were installed in the barn to record data for calculating the Temperature Humidity Index (THI). In addition, individual animal data were recorded by automatic milking systems (milk yield, fat-protein ratio, fat and protein content, somatic cell count) and activity sensors (feeding time, rumination time). For statistical analysis, the mean value of BST (mBST) was calculated from the three measurements per body region and body side. Generalized linear mixed model analysis revealed for three (eye, flank, Fossa paralumbalis) of the four body regions higher mBST in HI cows (all $p<0.01$; e.g., eye mBST (°C): HI: LS-mean±SE = 38.14±0.05, LI: LS-mean±SE = 37.92±0.05, $p=0.0071$) and for all body regions influence of THI on mBST ($p<0.01$; higher mBST with higher THI). Regarding the milk content, feeding and rumination time, there were no influences on mBST ($p>0.05$). These preliminary findings indicate that a high input feeding results in higher mBST, which could have negative consequences for animal welfare under heat stress conditions.

Session 8 Poster 28

Health assessment in Swiss dairy production with confinement or pasture-based feeding

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The majority (88%) of Swiss dairy herds have access to a pasture in summer. An increasing number of farms apply a confinement-based feeding strategy where the pasture is used for animal welfare. In contrast, farms with pasture-based feeding strategy feed whenever possible on pasture. The aim of this study was to compare several health indicators in these two dairy systems throughout the year. Each 15 farms of the two systemes were visited once during spring, summer and autumn to assess the prevalence of hairless patches, injuries, swellings and lameness using a standardized protocol. Compared to the pasture-based system, the confinement-based system had (median and range) more hairless patches 15.2% (2.9-60.0%) vs. 4.2% (0-41.0%), injuries 4.5% (0-36.7%) vs. 0% (0-4.3%), swellings 6.5% (0-30%) vs. 0% (0-4.2%) and lame cows 11.4% (0-40%) vs. 0% (0-9.5%). Confinement-based herds consisted mainly of dairy breeds and 80% of the pasture-based herds of dual-purpose breeds. Average milk yield (±SD) was 9800 (±881) kg/cow/year in confinement-based systems and 5920 (±910) kg/cow/year in pasture-based systems. Several factors can affect health issues. These may be related to the quality of housing systems which differed among farms, but also to factors such as breed and production level. In addition, grazing and regular hoof care influence claw health and therefore the prevalence of lameness. Since all pasture-based herds and 44% of the confinement-based herds are longer than 4 hours/day on pasture and the period with pasture access is on average 7.5 (SD=1.3) months in the confinement-based system and 8.8 (SD=0.7) in the pasture-based system the farm effect might eventually be larger than the system effect for these health issues, further analysis is required to statistically evaluate if the season or system has significant influence on these parameters. Although there is a clear difference in feeding strategy and production level among the two dominant dairy systems in Switzerland animal welfare is influenced by many other factors, and therefore a careful analysis needs to be done before conclusions can be drawn.

Session 8 Poster 29

Automatic Long-Term Measurement of Lying Behavior in Crates and Free Farrowing Pens Using 3D Accelerometers

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The effect of the farrowing system on sow lying behavior has been studied around parturition, but not long-term. Here, we aimed i) to validate the methodology to automatically measure sow lying bouts and duration with accelerometers and ii) to apply it to crated and free farrowing sows 24 hours pre-parturition until weaning. We used video observations as ground truth for validation and calculated the agreement with an intraclass correlation coefficient (ICC), which was 0.30 [-0.10-0.64] for the number of lying bouts. The ICC increased to 0.86 [0.40-0.95] when corrected for transitional sitting bouts. The ICC was 0.93 [0.26-0.98] for lying duration. We evaluated effects of housing, day relative to parturition, and time of day on lying using the accelerometer data and linear mixed models. In crated sows, the number of lying bouts increased toward parturition, peaking at about five bouts per six hours and decreased to almost zero bouts after parturition. Then, it increased again ($P = 0.001$). In free farrowing sows, the number of lying bouts gradually decreased from a high level towards parturition and was lowest after parturition. It remained constant, as in the crated sows, until day 15, when the number of bouts increased to eight bouts on day 20 ($P = 0.001$). Sows in both systems were lying almost all of the time between 18:00-00:00 h and on all days ($P = 0.001$). The crated sows showed a very similar pattern in the other three quarters of the day with a reduced lying time before parturition, a peak after parturition, reduced lying time from days 5 to 20, and an increase again towards weaning ($P = 0.001$). Free farrowing sows had a similar pattern to the crated sows from 00:00 to 06:00 h, but without the reduction in lying time from days 5 to 20. They showed an increase in lying time toward parturition, which remained constant with a final decrease toward weaning, especially during the day ($P = 0.001$). This study proves the accuracy of accelerometer-based sow lying behavior classification and shows that free farrowing systems benefit lactating sows around parturition but also towards weaning in the nest-leaving phase by facilitating activity.

Session 8 Poster 30

Breeding for a better survival of piglets in organic farming: consequences on maternal cortisol and neonate metabolic status

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Neonatal mortality is high in pig farming, and even higher in organic farming. A strategy for reducing this mortality is to select more maternal sows, producing fewer but more robust piglets. We selected a Large-White maternal line over two successive generations for limited litter size and increased piglet survival in organic conditions. In the present study, we explored whether this selection influenced the physiology of the mothers and offspring in two different farrowing conditions (loose or restrained sows at farrowing). We collected saliva from sows of the G1 (n=48) and G2 (n=33) generations around their 2nd farrowing (at 8h and 13h on days 108 and 112 of gestation and day 4 of lactation (D4), at 8h on D11). Blood was collected from a subset of piglets aged of 24 ± 6 h (n=81 from 28 G1 litters and n=96 from 32 G2 litters). Gestation length increased by 0.86 days (P=0.017). The genetic trend for lower litter size at birth was observed in first parity (G1: 16.25 to G2: 14.43 ± 0.62) but not afterwards (more than 16 total born), and survival rate on D49 was not different (70.86% in G1, 67.04% in G2). G2 sows had lower salivary cortisol than G1 sows on 4 out of the 7 sampling times (P<0.01), and restraint had no influence. Piglet weight at 24h was comparable for G1 and G2, and positively correlated with plasma concentrations of lactate (P<0.05), glucose (P<0.01), albumin (P<0.001), and hydroperoxides (P<0.01). G2 piglets had higher levels of albumin (P<0.05) and hydroperoxides (P<0.001) and lower plasma antioxidant capacity (P<0.001) than G1 piglets. Blocking sows around farrowing induced lower lactate but in G1 only (P<P.05), and lower glucose but in males only (P<0.05). Immunoglobulin G concentration was not affected by any factor. In conclusion, selective breeding seems to have influenced dams' secretion of cortisol, an hormone fundamental to the control of energy metabolism and stress response, and favoured better metabolic maturity in piglets at birth. These results are to be confirmed on the G3 generation. The project PPILOW received funding from the EU Horizon 2020 program (grant agreement N°816172).

Session 8 Poster 31

Sow mortality in Danish conventional herds increases - but not in organic herds

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It has been suggested that increasing herd size, confinement housing and changes in feeding practice play a role in an increased mortality rate in sows over the years. Therefore, it is worth investigating potential differences between mortality rates in organically and conventionally housed sows. The aim of our study was to investigate trends in sow mortality rates in organic and conventional systems. We used national Danish databases to investigate mortality rates in sow herds during an eight-year period from 2015 to 2022. Data was extracted from the Central Husbandry Register on the number of sows per year in all Danish sow herds and on the number of dead sows moved to the destruction facility from each herd each year. Mortality rates were calculated as mortality per 100 sows per year (and presented as %). We excluded herds smaller than 20 sows per year and herds with a mortality rate above 40% (expected to be recording errors). During the eight-year period, herd sizes in both systems increased. The average herd size for conventional herds increased from 588 sows in 2015 to 743 sows in 2022. The size of organic herds increased from 265 sows in 2015 to 318 sows in 2022. In both organic and conventional herds, we found large variation in mortality rates between herds. In organic herds, mortality rates varied between 0% and 22%. In conventional herds, the variation was from 0% to 29% across the years. In both systems, the average herd-level mortality rate during 2015 to 2017 was approximately 9%, ranging from 8.7% (min) to 9.2% (max). From 2017 to 2022 herd-level mortality rates in conventional herds increased from an average of 8.7% to an average of 12.9%. In organic herds we did not see an increasing trend. Thus, in 2015 and 2022 the herd-level mortality rates estimated in organic herds were 8.7% and 8.5%, respectively. Overall mortality rates estimated in this study are lower than estimates published by the Danish pig industry. This seems to be explained by the present study exploiting all available data and taking into account herd variations. The fact that an increasing trend is not seen in organic herds suggests that housing and management influence sow mortality, though the study cannot explain the causes of this difference.

Session 8 Poster 32

Udder lesions on Swiss dairy goat farms in relation to duration of goat keeping, herd size and horn status

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In several Swiss goat breeds, horns are part of their breeding objective. In free housing due to social interactions, horns can increase the risk for injuries, especially udder lesions in dairy animals. Aim of this study was to assess the prevalence of udder lesions on 45 Swiss dairy goat farms with a free housing system and to investigate associations with herd size and horn status, and experience with goat husbandry. The famers participated willingly and their farms were visited one time between February and March 2020 or between February and April 2021. All animals on a farm that were milked at the milking time during the farm visit were assessed for udder lesions. The entire udder was visually inspected using a hand mirror with an LED spotlight, which was held between the legs, and without touching the udder. Udder lesions included acute and healing injuries (superficial and deeper scratches and scabs) and the scars of larger, massive injuries (e.g. from stitching). Duration of goat keeping, herd size and horn status were assessed. Three farms had to be excluded from analysis due to missing data. Associations were calculated through Pearson Correlation in R. Farmer kept goats on average for 24 years (range 4 to 50 years) and had on average 45 adult dairy goats (13 to 160). The percentage of goats with horns in the herd was between 38 and 100% (median: 93%). The median herd prevalence of udder lesions in the sampled goats was 3.6% (range 0% to 46.6%). Goats with lesions mostly had scars (44%) and superficial lesions (44%). No correlation was found with herd size and year when farmers started to keep goats. Farms with higher percentage of horned goats had less goats with udder lesions (-0.457; p=0.002). Further analysis is needed to identify factors of the housing and the management that impact the prevalence of udder lesions.

Session 8 Poster 33

Cow welfare assessment using ChatGPT Vision

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Animal-based welfare assessment is usually conducted by trained assessors. Farm audits typically cover only a fraction of the herd, and the results vary based on the assessor's skill and experience. The infrequent, costly, and time-consuming nature of farm audits underlines the potential advantages of adopting automated assessment methods. We employed a large multi-modal model, ChatGPT Vision (GPT-4V), to automate the binary classification of cattle cleanliness (i.e., dirty and clean). We trained GPT-4V with the Welfare Quality Protocol (WQP) text instructions and provided 2 image examples per category to categorize dairy cow cleanliness across 3 body parts: hind leg, hindquarter, and udder. Our test dataset included 24 images (4 dirty and 4 clean images per body part) that have been previously assessed by 5 experts and were used in auditor training. To improve model performance, we used prompt engineering techniques including role-playing (i.e., "act as an animal welfare assessor with 20 years of experience") and emotion prompting (i.e., "this is vital for my career"). GPT-4V demonstrated an acceptable level of agreement with expert assessments across the entire dataset (Cohen's Kappa=0.42, P=0.01), but was biased towards labeling images as dirty (precision = 0.63, recall=1.00). It particularly excelled in the evaluation of lower hind leg cleanliness (Cohen's Kappa=0.75, P=0.03; precision=0.8, recall=1.00). Considering only the cleanliness of lower hind leg and hindquarter areas, the agreement reached a level which is considered acceptable for welfare quality control organizations (Cohen's Kappa=0.63, P=0.01; precision=0.73, recall=1.00). To eliminate background noise and potentially boost model performance, we applied two image processing techniques: segmenting the cow from the background and isolating the target body part for assessment. Both techniques did not yield improved results. We recommend future researchers to provide more training examples to GPT-4V to enhance model performance and extensive testing of large multi-models across various WQP criteria to further assess the feasibility of automated welfare assessments on farms.

Session 8 Poster 34

Weaner pigs: well occupied by automatic enrichment?

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This study investigated the usage of automatically provided enrichment material by weaner pigs. In one compartment with six pens (24 pigs/pen), three pelletized materials (alfalfa (AL), oatbran (OB) and a mixture of both (MI)) were released simultaneously (10 g/pig/supply) to individually marked pigs on a mat (0.6 x 1.2m) in two batches. Video analysis determined the number of pigs using the material. For the first three pigs (FA), the time until starting (ST) the exploration and the duration (ED) was recorded. One batch received two (EF2), the other batch six (EF6) supplies a day providing one of the three materials each constantly to two pens. Statistical analysis was performed in R using the Wilcoxon rank-sum test to compare median values of ED. Animal behaviour changed as soon as the material became available. One minute after the supply, on average 49.3% of the pigs explored the material. ST was highest in week 1 (9 and 12 sec for EF6 and EF2) and decreased to two seconds in the other weeks. The ED was highest in week 2 (288.0 and 311.0 sec for EF6 and EF2) and decreased in the following weeks. Significant ($p<0.05$) longer ED was observed for OB pellets. Enrichment frequency had no significant effect ($p>0.05$) on the ED (137.5 and 112.0 sec for EF2 and EF6). Further improvements are required in the management of an automatic enrichment device to maintain the attractiveness for the pigs to enhance the positive effects on animal welfare. The study is part of the project DigiSchwein, which is supported by funds of the Federal Ministry of Food and Agriculture (BMEL) based on a decision of the Parliament of the Federal Republic of Germany. The Federal Office for Agriculture and Food (BLE) provides coordinating support for digitalisation in agriculture as funding organisation, grant number 28DE109E18.

Session 8 Poster 35

The effect of different seasonal thermal conditions on saliva analytes in dairy cows.

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This study aimed to assess changes in dairy cows' saliva analytes related to stress, immunity, oxidative status, and metabolism in different seasonal thermal conditions. A possible effect on behavioural time-budget and its correlation to saliva analytes were also investigated. Saliva was collected in 10 healthy dairy cows at two different time points: T1 in winter (THI 45) and T2 in summer (THI 78.5). At T1, the mean DIM (days in milk) was 68d +/-26, whereas at T2, it was 216d +/-26. The cows were housed in the same environment and feeding with the same diet at both periods. An accelerometer was fitted to each cow to record behaviours (eating, rumination, lying, standing, walking). The behavioural time-budget at the day of the sampling was considered. Salivary and behavioural parameters were compared by T-test between both seasons, and a correlation study (Spearman's Rank Test) was also performed. Cortisol, butyrylcholinesterase (BChE) and total esterase (TEA) increased in winter, while concentration of free oxytocin and oxytocin linked to proteins increased in summer ($P<0.05$). In winter, there was a significant increase in all oxidative status analytes: cupric reducing antioxidant capacity (CUPRAC), Trolox equivalent antioxidant capacity (TEAC), ferric reducing ability of saliva (FRAS), and advanced oxidation protein products (AOOP). Similarly, urea and total protein increased ($P<0.05$). Conversely, an increase of creatine kinase (CK) was observed in summer ($P<0.05$). No difference was found in the behavioural time-budget between different seasons. Lying was negatively correlated to salivary alpha-amylase (sAA) and TEA, and positively to BChE, oxidative status analytes, and lactate. A positive correlation was found between rumination and BChE, FRAS, and lactate. Cows' saliva profile could be influenced by season in a subcontinental climate zone. Combining salivary and behavioural parameters could help in monitoring physiological and behavioural conditions during seasonal changes.

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Investigating the impact of loose material and space allowance on tail biting outbreaks and carcass characteristics of post weaning pigs

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In order to comply with the current EU animal welfare legislation, pig farmers are required to adapt their management practices, especially with regard to tail docking, without sacrificing the profitability of their enterprises. This study compared the impact of four manipulable enrichment materials (Straw, Haylage, Hay and Grass) applied to pigs in similar pens containing either 8, 10, or 12 pigs (weaner: 0.78, 0.62, 0.52m2/pig; finisher: 1.2, 0.6, 0.8 m2/pig, respectively) on carcass characteristics and tail biting outbreaks. At weaning, 47 litters with undocked tails were assigned as litter groups to enrichment and space allowance treatments using a 4 × 3 experimental design. Enrichment was provided ad lib via a mesh rack hung on the door of the pen. All trial pigs were slapped with unique codes for individual carcass identification. Fasted weights of the finisher pigs were taken on the day of slaughter and cold weight, lean meat and fat percentages were acquired from the abattoir. Pens were observed daily for signs of tail biting and an outbreak was considered to have occurred when two or more pigs in the pen had blood on their tails. There were no interactive effects. However there was an overall effect of space allowance on the fasted live weights ($P<0.05$), with those in pens of 8 (135.59±0.97kg) weighing more than those in pens of 12 (132.19±0.82 kg; $P<0.05$). Forty-eight tail biting outbreaks were observed, with 2 in pens of 8 (4%), 10 in pens of 10 (21%) and 36 in pens of 12 (75%). Fewer outbreaks were observed in Grass and Straw pens (5 each, 10% respectively) than in Hay (n=18, 38%) or Haylage pens (n = 20, 42%). The results indicate that pigs reared with a lower space allowance had lower weights at slaughter and were more likely to experience tail biting. Straw and Grass seemed to be more effective at reducing tail biting outbreak occurrence than Hay and Haylage. Nevertheless, none of the treatments influenced carcass characteristics. These findings highlight the importance of adequate space allowance and benefits of suitable enrichment on pig welfare.

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Use of a 'priority lane' to increase voluntary visits to a milking robot in dairy cows

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Voluntary visits to the milking robot are the basis of automatic milking system (AMS) functionality. Therefore, problems can arise in cows with low voluntary milking visit frequencies (VF). Cows with mobility issues or low social rankings are at higher risk of lower VF, given their reduced ability to compete for access to the milking robot. These cows typically have reduced autonomy and associated welfare benefits as they must adhere to the milking schedules of more dominant herd-mates. Solutions seeking to increase the visits of these "high-risk" cows may thus improve welfare and productivity within AMS. We explored the effects of a 'priority lane' on VF and hair cortisol concentration of these "high-risk" cows managed in an AMS. We hypothesised that cows with priority lane access would visit the robot more frequently and have lower hair cortisol levels. Twenty-four lame (mobility score ≥ 2) or low-ranking (lowest third of herd) cows were matched into 12 pairs of equal mobility score and social ranking. Every pair had one priority cow and one control cow, and all cows were managed within the same pen, meaning that priority cows could also use the 'main' robot entrance. An additional 18 cows were included in the herd to increase competition but did not have access to the priority lane. Data were collected over a 5.5-week period and analysed by linear regression. As predicted, priority cows had higher VF than control cows (7.8±2.5SD vs. 5.7±1.7 visits daily, $p=0.02$). Specifically, non-milking visits differed significantly between groups ($p=0.02$), whereas milking visits did not ($p=0.1$). Priority cows also had less variable milking intervals ($p=0.02$), which is beneficial to udder health. Finally, no significant differences in cortisol were found between groups (14.81±5.7 vs. 14.92pg/mg±5.3, $p=0.56$). In conclusion, priority access increased VF in "high-risk" cows, which is likely to positively influence welfare and affect the number of daily milkings favourably under conditions of greater competition.

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Subcutaneous abscesses as welfare indicator in small ruminant dairy flocks

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Abscesses in sheep and goats are typically the result of bacterial infections due to poor management and environmental conditions that make animals prone to injuries. They can occur either internally or externally and can cause pain, discomfort, reduced productivity, and even death of animals in severe cases. Our objective here was to assess the prevalence of subcutaneous abscesses in dairy sheep and goat flocks and to identify the underlying factors associated with farm conditions and overall flock health management. Animal assessments and data are collected since February 2024 from a representative number of 30 farms of dairy sheep and goats. In each farm, animals are subjected to a thorough inspection and palpation for abscesses. Observed abscesses are measured and their dimension recorded. A designated questionnaire with 50 specific questions about flock health and management has been developed to interview farmers. Preliminary results have been obtained from 21 farms, with a total of 5,513 animals been assessed. The average prevalence of abscesses was 12.59%. Poor hygiene, inappropriate facilities for feeding, narrow corridors with sharp edges, and absence of prompt treatment of injuries were the main underlying factors contributing to abscess formation. About 63% of farmers stated that the problem is common in animals imported in the flock either from other flocks or from abroad. In practice, draining of abscesses is the common approach performed and usually by unqualified personnel, with rates of 75% and 70%, respectively. Overall, the results so far have shown that welfare implications arise from the suffering experienced by affected animals depending on the size and the volume of abscesses. Hence, the work is expected to reveal the importance of proactive measures to mitigate abscesses in dairy sheep and goat farms considering their role in animal welfare. This work is part of a research project funded by the Region of Eastern Macedonia & Thrace (ELKE-AUTH: 76290).

Session 8 Poster 39

Multidisciplinary analysis of keel bone damage in laying hens

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Keel bone damage (KBD) is one of the major welfare problems in laying hens. In addition to deviations, KBD includes traumatic and non-traumatic fractures. It is unclear how non-traumatic fractures emerge. Some studies indicate that the early start of laying and the high laying performance have a major influence on the development of non-traumatic fractures. Only few studies were done on the incidence of KBD in traditional chicken breeds which are characterized by slower growth, later sexual maturity, and low laying performance. While genetic predisposition and type of housing system appear to have an important influence on KBD, less is known about the influence of breed-specific behaviour and management. Thus, the aim of the current study is to investigate the development of non-traumatic fractures on a multidisciplinary scale. Various laying strains, traditional chicken breeds and the Red Jungle Fowl are examined using radiological, endocrinological, neuro-anatomical and ethological methods. First data analyses show differences between laying strains, traditional breed and Red Jungle Fowl concerning the start of egg production, distinct egg quality parameters, such as the strength and thickness of eggshells, and the calcification process of the keel bones. Behavioural parameters, such as the frequency of crashes or flight events, also differ between groups. Further analysis will show to what extent the intensity of egg production, keel bone stability and behavioural parameters are linked. The results of the current study can contribute to improve animal welfare.

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The application of roller and bite-ball devices to stimulate nest-building behaviour of sows in a crating system: their effects on farrowing process and sow postures during parturition

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The nest-building (NB) behaviour is an important maternal instinct for prepartum sows, essential for their successful farrowing and lactating performance as well as their welfare. However, sows in modern pig farms often face limitations in expressing this innate behaviour within farrowing crates due to space constraints and a lack of suitable materials. This study aims to evaluate the availability of roller and bite-balls in stimulating NB behaviours among sows housed in a crating system, and subsequently examine their impacts on the farrowing process and postures of sows during parturition. A total of 22 sows were housed in the farrowing crate and assigned to one of three treatments: 1) Control (n = 8), 2) Roller (n = 7), 3) Bite-ball (n = 7). Roller (L: 72cm, D: 6cm) and Bite-ball (two balls attached to stiffer springs, D: 9cm) were installed in front of the feed trough seven days before parturition. Sows were video-recorded by IP cameras from 24h before parturition until the end of farrowing, enabling the analysis of prepartum NB behaviour (pawing, rooting, and manipulating to structures), farrowing duration, and postures during parturition. Sows provided with Roller exhibited longer NB duration than Control and Bite-ball sows (113.65min vs 65.24min vs 65.79min, $P < 0.001$). The farrowing duration did not differ between treatments ($P = 0.18$), but Bite-ball sows showed numerically longer farrowing duration compared to other treatments (525.8min vs 288.3min vs 227.2min). Sows provided with Roller spent more time lying sternal than those of Control (6.79min/h vs 2.76min/h, $P < 0.05$). In conclusion, roller can be utilized for stimulating NB in a crating system. However, this stimulation did not confer benefits to the farrowing process of crated sows. To harness the potential benefits of NB behaviour, the provision of nesting materials containing manipulatable characteristics should be considered within the crated system.

Session 8 Poster 41

Evaluation of seasonal effects on the welfare of pigs on outdoor farms in Ireland

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Pigs are mainly produced indoors on the Island of Ireland but there is increasing interest in meat from higher welfare systems, including outdoor. This study evaluated the welfare of outdoor reared pigs considering the influence of seasonal variation. Twenty farms were visited during both winter/spring (total 222 animals, 19 farms) and summer/autumn (total 223 animals, 17 farms). Pigs were assessed for the following welfare indicators: body condition score (BCS: 1–5), lameness (0-5; clinical lameness ≥ 2) ear lesions (0-4), tail lesions (0-4), eye tear stains (0-4) and the number of old and fresh skin lesions. In all cases, the lower end of the scale indicated the best possible condition, with the highest indicating worst. Additionally, we recorded the presence of external parasites, notably lice (eggs, adults). None of the assessed pigs had undergone teeth clipping, and their tails were intact. Statistical analyses were by RStudio, employing Wilcoxon signed-rank tests to analyse the seasonal effect on welfare indicators. The BCS of the pigs was favourable (Median = 3). The number of animals with impaired gait (score = 1) was higher in winter/spring than in summer/autumn (14 vs 3, $P < 0.01$), but none of the animals exhibited signs of clinical lameness. Ectoparasites were evident on more pigs in winter/spring than summer/autumn (30 vs 17%, $P<0.001$). Skin lesions tended to be higher in the summer/autumn than winter/spring ($P = 0.05$), as were tear stain scores for both eyes (median 2 vs 1.5, $P < 0.05$). There were no seasonal effects ($P>0.05$) on tail or ear lesions, and only 3 and 5 animals had high scores for both (ear, >2); tail >1). The welfare of pigs in outdoor production systems in the island of Ireland was generally good in spite of minor seasonal differences for several measures.

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A systematic review of non-nutritive oral behaviours in dairy calves

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On many dairy farms, calves are separated from the dam shortly after birth and then housed either individually or in a small group of similarly aged individuals. During the milk feeding period, calves are highly motivated to suckle, but many farms do not allow calves the opportunity to engage in this behaviour, sometimes resulting in redirection of sucking on pen fixtures or pen mates. These non-nutritive oral behaviours (NNOBs) can persist after weaning, and sucking on other individuals (i.e., "cross-sucking" or "inter-sucking") can increase the risk of teat and other injuries, potentially discouraging farmers from housing calves socially. Much research has been conducted on the prevalence and management of these behaviours, but to date research findings have not been summarized systematically. We conducted a systematic review that aimed to synthesize research findings on NNOBs in dairy calves. Using the Web of Science, we identified 289 peer-reviewed publications in the primary literature. Titles and abstracts were then screened to confirm relevance (n=94) and the full papers were read to ensure they met our inclusion criteria (n=87). Reference lists of the included papers were scanned to find further relevant papers (n=3). From selected papers (n=90), we recorded authorship, publication year, country, breed, sample size, housing type, NNOB assessed, interventions implemented, author's conclusion, and intervention outcome. Extracted information was synthesized and evaluated to assess management practices which can reduce the prevalence of NNOBs. Preliminary results suggest that restricted or free suckling on the dam is the best way to reduce NNOBs; otherwise, a combination of feeding via artificial teat, providing roughage (hay and non-barley straw), and providing various enrichment items can help reduce rates of NNOBs. The results of this review can provide guidance for those seeking to reduce the prevalence of cross-sucking and other NNOBs in calves.

Session 8 Poster 43

Comparative Analysis of Behaviour and Blood Parameters of Laying Hens in Cage and Aviary systems

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The poultry industry increasingly phased out cage systems due to growing concerns about animal welfare. This study aimed to evaluate behaviour, heterophil to lymphocyte (H:L) ratio, and serum corticosterone levels of laying hens in cage system (CS), comparing them with aviary system (AS) as one alternative. Hy-Line Brown hens sourced from a single commercial poultry farm were housed either in a cage (n = 79,500 hens; 6 hens/cage; floor space = 0.075 m2/hen) or an aviary (n = 42,079 hens; floor space: 9 hens/m2) system. Behavioural parameters of the hens were assessed using the Welfare Quality protocol by five evaluators, including qualitative bahavioural assessment (QBA; n = 15 flocks), novel object test (NOT; n = 60 flocks, avoidance distance test (ADT; n = 315 hens). The H:L ratio (examined from 75 hens) was measured at 28, 38, and 48 weeks, respectively, and serum corticosterone levels (from 50 hens) were assessed at 48 weeks of age. In the results of QBA scores, the first principal component ranged from scared/depressed to bored, while the second component ranged from energetic/calm to content/friendly. Hens in CS exhibited higher scores of negative emotions and lower scores of positive emotions than in AS. The mean value of NOT in AS was higher than that in CS, indicating a greater number of laying hens approaching the novel object in AS at 38 and 48 weeks ($P < 0.01$, for both). Additionally, the avoidance distance was higher in AS compared to CS at all sampling periods ($P < 0.01$, for all). Hens in AS showed a higher H:L ratio than in CS at 38 and 48 weeks ($P < 0.05$, for both). However, the serum corticosterone levels did not differ between AS and CS at 48 weeks ($P = 0.446$). Our results indicate that hens in AS exhibited more positive behavior than CS. However, the H:L ratio, widely used as a stress indicator, may have been influenced by increased movement in AS, suggesting limitations as a sole stress assessment measure. Therefore, it would be a better approach to consider behavioral indicators in addition to blood parameter analysis when comparing stress and welfare in laying hens depending on housing systems.

Session 8 Poster 44

A literature review of precision wearable sensors: Validation techniques for evaluating dairy cattle behavior and welfare

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With the growth of wearable sensors in Precision Livestock Farming (PLF), there is a need for standardized tools and analytical approaches for validating data used to monitor animal behavior and welfare at the farm level. The objective of this research was to conduct a literature review of all published work in the PubMed database from 2009 to 2022 to summarize validation methodologies used to validate wearable sensors applied to dairy animals for monitoring behavior. An application, scite.ai, was used to sift through a collection of papers based on a calculated impact score to pick the top peer reviewed papers. Of these, 71% (22/31) compared sensor data to in-person observation, and 13% (4/31) used video observation using ethograms for cattle behaviors as the gold standard. Some 6% (2/31) compared their sensor output to another commercially available sensor, while 10% (3/31) also used this method in addition to in-person observations. Validation studies observed 1 to 9 different behaviors. In total, 61% (19/31) measured rumination (rumination, rumination time), followed by eating 58% (18/31; eating, eating time, grazing, feeding), 48% lying (15/31; lying, lying bouts, lying time, resting), and standing 26% (8/31; standing, standing bouts, standing time). A consistent methodology for validating PLF wearable sensor outputs is lacking with a variety of gold-standard comparison methods and different statistical methodologies used. We suggest that standardized definitions for accuracy, bias, precision, and sensitivity and specificity values for research that validates wearable sensors for PLF are needed. Building on these existing studies and current research underway allows for the identification and development of more consistent behavior classification with a focus on improving animal welfare on the farm.

Session 8 Poster 45

Hormonal treatment of breeding sows – impact on pig welfare

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The main target of the intensive pig breeding industry is to wean as many piglets as possible in the shortest possible time. Hormonal treatment enhances the performance of sows to approximately two pregnancies with up to 34 weaned piglets per year. For this purpose, the sow's oestrus is triggered with hormones like gonadotropins, analoga of gonadotropin-releasing hormones or progestogens to reduce the weaning-to-pregnancy intervals. This hormonal manipulation of the sow's fertility enables high performances even under deficient conditions like poor husbandry, stress, bad hygiene and poor health. This procedure achieves more piglets per sow each year and an increased economic efficiency of a pig farm – but at the expense of health and welfare of sows and gestated piglets. This investigation collected data from recent research about the modern reproduction management of pigs, pictures the role of hormonal treatment and its side effects as well as pathological findings in sows and piglets. The data were analysed regarding the consequences and impact on pig welfare. Unplanned culling due to management-related reproductive disorders and diseases happens to 34 %-66 % of sows worldwide. Studies on the reproductive organs of slaughtered sows show a significant quantity of pathological alterations like chronic endometritis and other severe inflammations. The superovulatory effect of hormonal intervention effects an abnormal high number of piglets per litter. There is scientific evidence about increased rates of stillbirths and piglet mortality with increasing litter size. Around 10-20 % of all piglets born alive die before weaning, the rate of stillbirths is alike. The surviving piglets face a high risk of suffering caused by teat competition and an inadequate access to breast milk. Starvation and long-term detrimental effects to health are the consequences. The results of this survey demonstrate the health and welfare impairing consequences for sows and piglets in pig breeding systems caused by routine hormonal performance-enhancement. A change to hormone-free animal friendly breeding managements, as already established in European ecological pig farms, is required, but further research is necessary for implementation in conventional systems.

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